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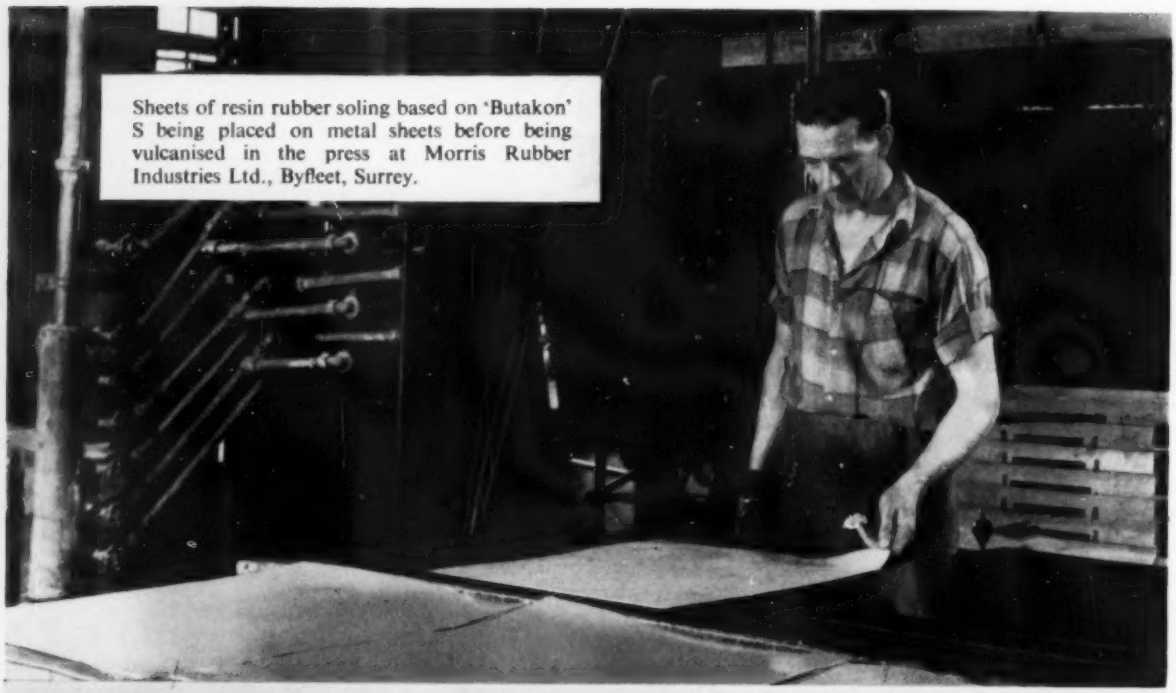

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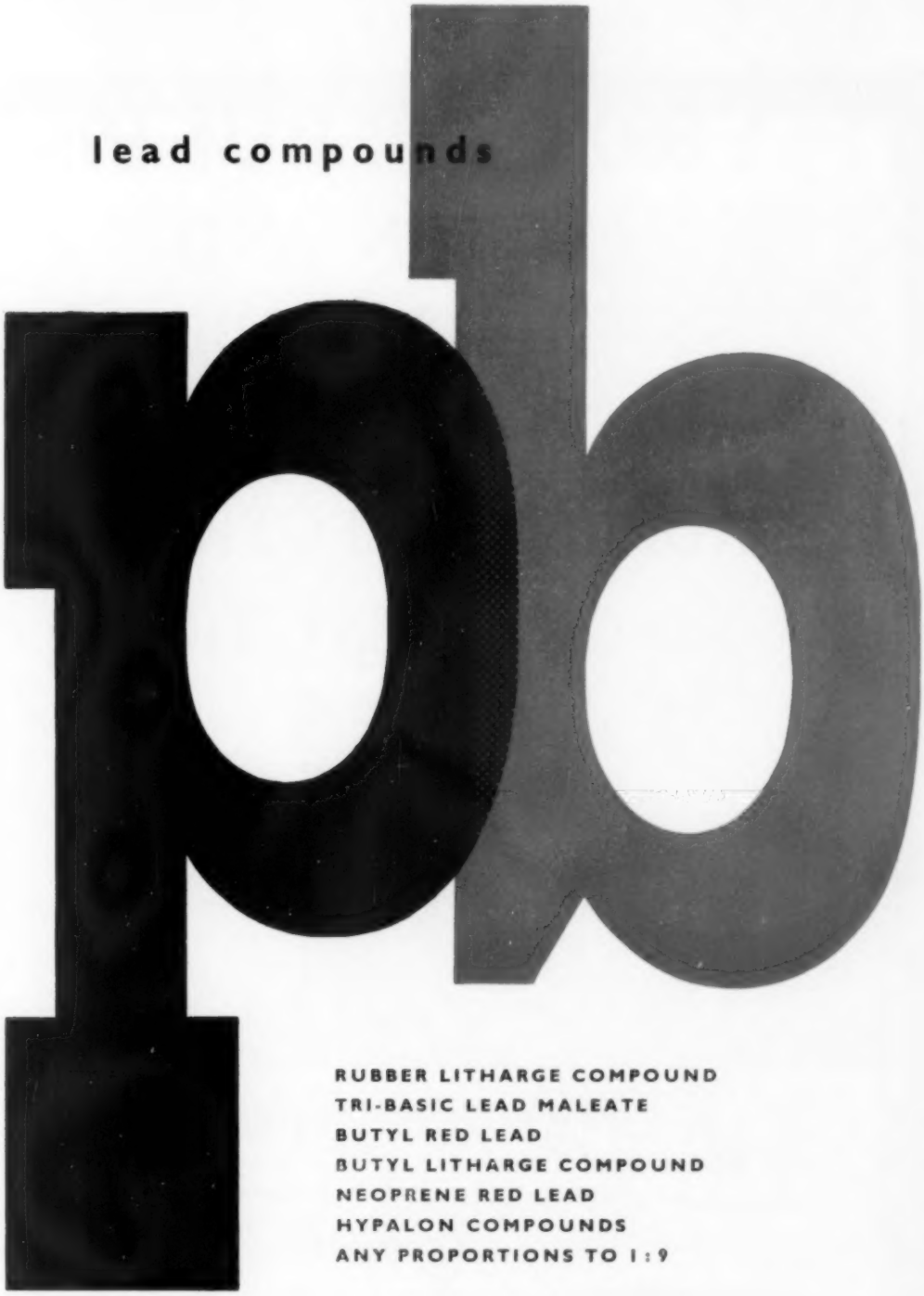

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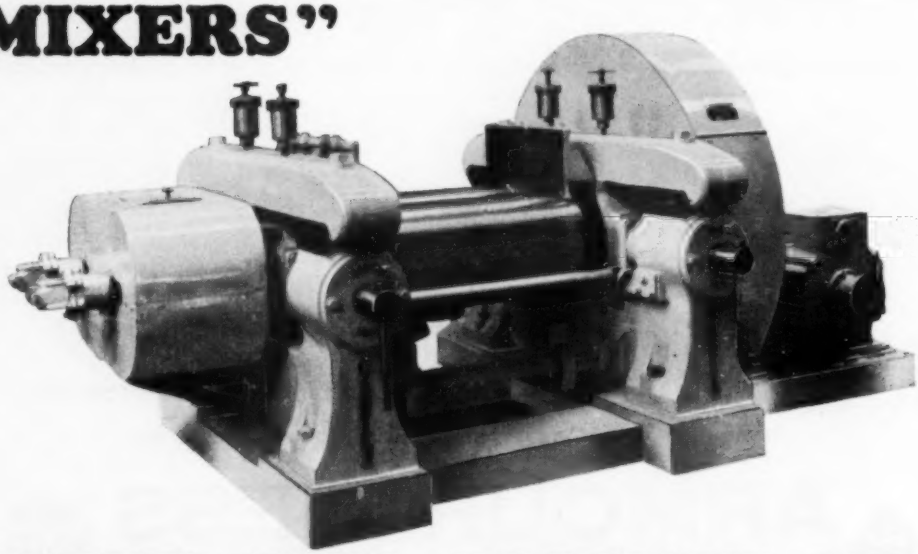

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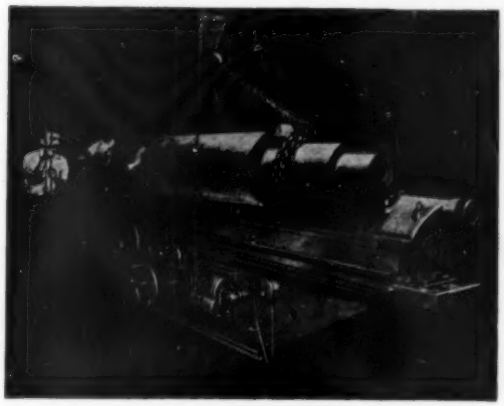

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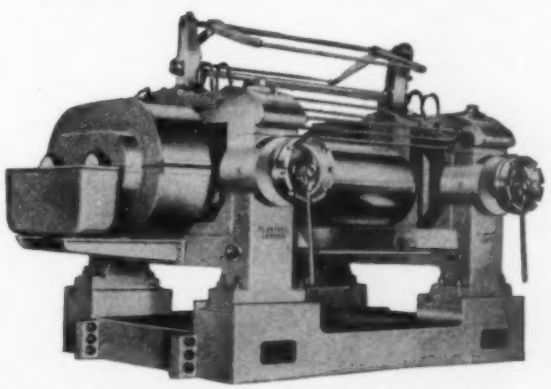

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IN ITS 76th YEAR

March 5 1960

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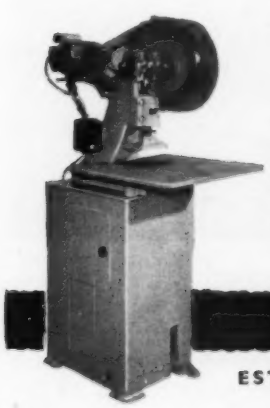

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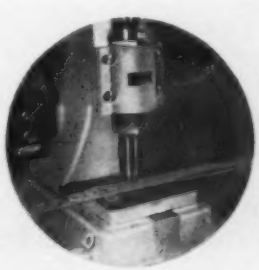

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NOTES of the WEEK

Both Eyes on Africa

SO much is happening so quickly in Africa that, after a while, there is a tendency not to notice any of it. Constant change becomes no change at all. But it is quite certain that, in the next two decades, businessmen as well as politicians will have to keep not merely one, but both eyes on Africa. The future of the developed countries lies in that of the underdeveloped; and something that seems insignificant now may be the seed for something much bigger. For instance, a figure of 34,000 tons of rubber exported from Western Nigeria in 1958-59 may seem unimportant compared with exports from Indonesia or Malaya. But this figure represents an increase of 130% on the 1952-53 figure—and the Western Nigerian Government has just announced a multi-million-pound expansion plan which will make this region an important rubber producer.

Developments towards this move have been taking place for some time, and last year over 12,000 farmers were trained in tapping, 300 in farm maintenance, and over 1,200 in processing. Nor has the research side been forgotten. What is called ' a major research programme ' is being instituted, and proposals have been advanced for the establishment of a Rubber Research Institute.

Africa as a whole is a small rubber producer—her total exports amount to only about one-fifth of Malaya's —and it is perhaps dangerous to speculate on how she will advance. She has a long way to go, and a lot will, of course, depend on the world demand for natural. But, all things being equal, we can predict that she will play a steadily more important role as a natural rubber producer in the world of the sixties and the seventies.

Too Independent

AS reported in this issue, the Malayan Rubber Goods Mfrs. Association objects to the Malayan Government granting Dunlop ' pioneer ' facilities to set up a manufacturing plant near Kuala Lumpur. Apparently the Association feels that its independence is being besmirched, and there are mutterings about foreign capital: they've no sooner reached political independence than their Government throws away their economic independence. This is a very short-sighted outlook, and it is easy to see how it arises. Like an adolescent, when a country first achieves independence it—or certain factions inside it—may become too independent, too eager to show that it can do everything all by itself, and too self-consciously proud and suspicious to take part in any form of cooperation.

It is good to see that, although the association appears to be bitten by this bug, the Malayan Government, in a down-to-earth reply, very roundly tells them off. They have to balance the budget and they know that capital investment of the kind that Dunlop is prepared to make at Kuala Lumpur means no sacrifice of independence—it is in fact a step towards the independence that comes from the establishment of an industry that can only bring fuller employment and greater prosperity to the country as a whole.

Talking in Swahili

FOLLOWING the presentation of prizes and diplomas at the sixth convocation of the National College of Rubber Technology last week, a conversazione was held during which the college was thrown open to visitors. As before, this proved very successful and many interested visitors saw a variety of experiments and exhibits with rubber and plastics which illustrated the valuable work of the college.

We heard one criticism, however, from a visitor who said that he had limited scientific knowledge and found the explanations of experiments difficult to follow. Apparently only one demonstrator took the trouble to explain in lay language just what a particular experiment was about. ' The rest,' he said, ' might as well have been talking in Swahili.'

The problem is a general one. In the recent Crowther report Sir Geoffrey Crowther coined the word ' numeracy ' as the scientific equivalent to literacy, implying that arts students should be urged to be able to handle simple scientific concepts, just as science students are encouraged to take an interest in the arts. But numeracy will not spread quickly amongst lay people until literacy—in the sense of clearness of expression—spreads through the scientists. They are not the only offenders, of course. When we talk about our jobs we all have our particular brands of Swahili. It is so much easier (and so much more impressive) to reel off a string of mysterious sounding words, than to struggle to explain to the uninitiated a complicated point. But it is so much better to be understood.

NEWS *Briefs*

PLASTICS FEDERATIONS IN PARIS—AUSTRIAN POLYPROPYLENE PLANT ON SCHEDULE—SBR PLANT FOR INDIA—TYRE YARN PRICE DROPS

●**United States**—Monsanto have announced a decrease in the price of styrene monomer from 12 cents to 11 1/5 cents per lb., which will be effective from July 1.

●**France** — Firestone is reported to have chosen an 81-acre site in Bethune, France, about 123 miles north of Paris, for a tyre, tube and synthetic rubber plant. Construction of what is called a 'multi-million' plant will begin immediately. The company says it should be completed by late 1960.

●**West Germany** — West Germany's production of plastics last year has just been disclosed as 794,000 tons —an increase of 28% compared with 1958. More than a quarter of West Germany's production of plastics—worth DM700m.—was exported last year, an increase of 24% over 1958. Best customers were Netherlands, Britain, Switzerland and Austria.

●**United States** — The Eagle-Picher Company will begin construction immediately of a $3m. plant at Fort Smith, Arkansas, for its Ohio Rubber Company Division. The new plant, to be completed by February 1961, will manufacture car floor mats, moulded precision rubber parts for cars, and general industries.

●**India**—A loan of 27,100,000 Indian rupees, the largest foreign currency loan in the history of the Export-Import Bank of Washington, has been granted to Synthetics and Chemicals Ltd. of India, for construction of an SBR plant. Manufacturing plant will be built near Bareilly, Uttar Pradesh. Total cost of the project will be about US$30,000,000. Capacity will be 30,000 and initial annual production will be 20,000 tons.

●**Portugal**—Firestone's new plant at Alcochete, near Lisbon, has now started production. Annual capacity is expected to be 120,000 truck and car tyres and tubes. A skeleton force of technicians and supervisors has been sent from Akron and other Firestone plants to direct the initial operations.

●**France** — The practicability of liaison between plastics federations of common market countries was considered at a meeting held in Paris on March 3 and 4. The meeting was convened by the Comité National Intersyndical de la Transformation des Matières Plastiques. Other points studied included that of the co-ordination of international plastics exhibitions; standardization of technical terms; nomenclature; the possibilities of labelling plastics articles, particularly domestic, with descriptions of heat mechanical and chemical properties; problems of toxicity, particularly in packaging, and other common problems.

●**Austria**—Danubia-Petrochemie AG announce that the erection of their plant at Schechat, near Vienna, is well within schedule. First part of the scheme, on which Sch.200m. is being spent, is due to be completed by the end of 1960, and should give an output of 5,000 tons a year of Daplen, a polypropylene. Danubia-Petrochemie is a new firm in which Montecatini has an interest.

●**Malaya**—China did more buying on the Singapore market last week. An order for 2,000 tons of first grade, March shipment, brought her total February order up to 7,000 tons.

●**Greece**—A statement from the Greek Government says that a motor tyre industry will be set up and will start producing in March 1961. Experts of Pirelli were considering a site for the erection of the tyre factory outside Athens, the statement said. The plant would cost between 3,400,000 and 4,500,000 dollars and would produce tyres worth between 7,000,000 and 7,500,000 dollars per year.

●**United States**—A new technical centre is to be built by the Naugatuck division of US Rubber, near its main plant at Naugatuck. Research and control testing will be done at the centre by a staff of 100. Construction will begin this year and completion is scheduled for 1961.

●**United Kingdom**—Courtaulds have announced a reduction of 3d. per lb. (about 6%) in the prices of their high-tenacity yarn for tyre cord. The new prices are now effective.

●**Russia**—The Soviet Union will grant Indonesia a long-term credit of about $250m., according to the Soviet news agency Tass. Russia is to buy more Indonesian commodities, including rubber.

●**United Kingdom** — Production of man-made fibres in January established yet another record, exceeding the previous peak in December by 10,000lb. Total production was 50.80m. lb., compared with 50.79m. lb. in December and 46.03m. lb. in January 1959.

'We, at least, recover the last N.J.I.C. award and if nobody hits the jackpot we make a small profit' — 474

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Rubber Bodies Amalgamate

SIR GEOFFREY CLAY AT KUALA LUMPUR

SIR GEOFFREY CLAY, Controller of Rubber Research, speaking in Kuala Lumpur on February 29, outlined a plan under which rubber bodies in London and Malaya would be fused into one organization. The British Rubber Producers Research Association, the Natural Rubber Development Board, Rubber Technical Development Ltd., and the London Advisory Committee, all in London, and the Rubber Research Institute in Malaya, would be amalgamated to form the Natural Rubber Research and Development Association.

He said also that the International Rubber Research Board and the International Rubber Development Committee would be merged into one organization—the International Rubber Research and Development Board. The Board would be a 'shop window to show that the rubber producing countries of the world are united.'

The Malayan Government would spend 12.4 million Malayan dollars this year on its natural rubber research programme, Sir Geoffrey said —four million dollars more than the average spent during previous years.

For the next five years, it was not possible for natural rubber to meet world demand, he added. It was therefore important that the next five years were used to apply research to the industry to reduce costs so that when competition between natural and synthetic became keener the natural rubber industry would be in a better position. He felt confident in the future of natural rubber.

'Stifling' Charge

The Malayan Government has denied that the granting of pioneer status for the manufacture of tyres and tubes to the Dunlop Rubber Co. (*RJIP*, February 27) was an attempt to 'stifle local initiative.' The denial was issued after the Malayan Rubber Goods Manufacturers Association had charged that the Government was trying to 'perpetuate the commercial and industrial policies of the colonial days and stifle local initiative.'

The Government statement said: 'The Government has clearly condemned colonialism in any form or guise and it must be realized that attracting foreign capital or creating favourable climate to attract foreign capital does not mean the idea is colonial. We need capital whether foreign or local, and unless capital is forthcoming for the economic development and diversification of the economy of this country, we will not get anywhere with our industrial development.'

The Government added that it was only after a careful examination of the many factors involved that the Dunlop Rubber Company have been awarded the pioneer status for the manufacture of vehicle tyres and tubes.

Plastics at Osaka

The Plastics Industry Hall will be the largest special pavilion at Japan's 4th Osaka International Trade Fair, April 9-26 1960. It will occupy a floor space of over 3,300 sq. m. Over 200 booths will show every phase of the Japanese plastics industry—86 for products and 120 for processing machinery.

The fair will be the biggest ever held in Japan, occupying a total ground area of 179,800 sq. m., and an estimated 589m. yen will have been spent on it. It is reported that a far greater success is expected this year, particularly in plastics, reflecting the 288% growth of the industry in Japan in the last five years.

I.C.I. Severnside

FACTORS BEHIND THE DEVELOPMENT

BEHIND the Severnside development (*RJIP*, February 20), I.C.I. stated last week, is a marriage of two opportune factors. First, the assistance of Esso in contracting to supply ethylene at the rate of 40,000 tons per annum. The second factor is 'the sanguine view which I.C.I. is able to take of existing and future market trends for olefines and olefine derivatives, both inside and outside the company.'

When the demand for other olefines is established at Severnside, and when the ethylene offtake is great enough to support a large modern olefine plant, I.C.I. is likely to return to the manufacture of further quantities of ethylene by naphtha - pyrolysis at Severnside. In the meantime, however, the new works, by rapidly expanding ethylene utilization and indirectly promoting much intensified propylene utilization, will be no more than a logical extension of ideas conceived during the war, and first put into practice with the start-up of No. 1 Olefine Plant at Wilton Works in 1951. At Severnside, I.C.I. will be the first company in Britain to operate the Scientific Design Company Inc. process involving direct air oxidation of ethylene to ethylene oxide.

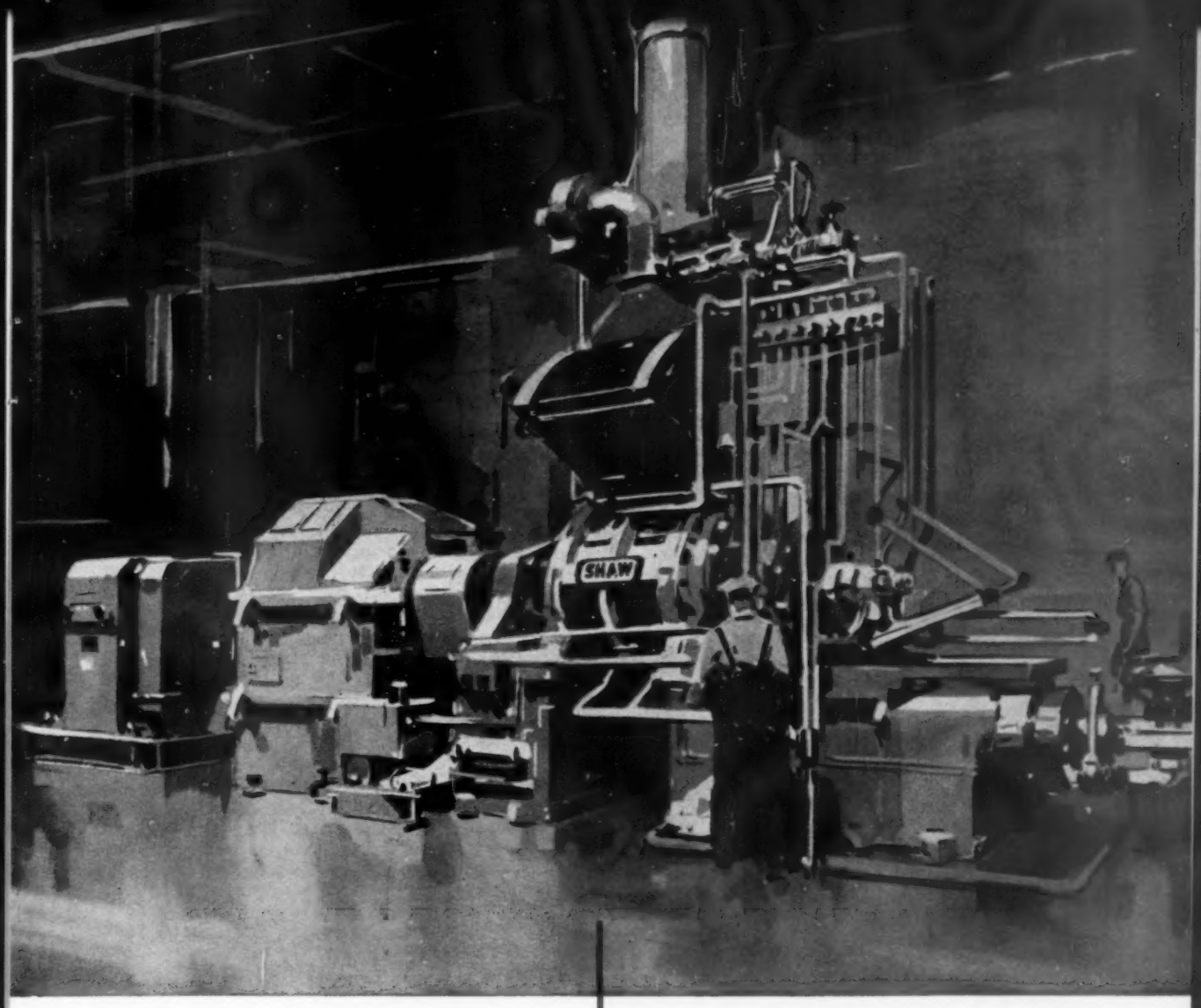
I.C.I. state that olefine utilization by heavy organic chemical division—now to be at the three manufacturing centres of Wilton, Billingham and Severnside—more than ever forms the core of its interlocking operations; still by far the largest-tonnage olefine, ethylene has its main market in 'Alkathene.'

Present propylene capacity is 80,000 tons per annum and growing rapidly. 'Propathene' is expected to make increasing demands on capacity from mid-1960 onwards. Propylene glycol and propylene oxide, manufactured at Wilton by the chlorhydrin route, are already making important contributions, mainly in the spheres of polyurethane foams and polyester resin manufacture.

Wilton capacity for both propylene and C_4 hydrocarbons — including 14,000 tons per annum of butadiene—will be increased, together with the output of associated plants utilizing the olefines—some of these being at Billingham Works. In the field of carbonylation, further extensions are being installed which will consolidate I.C.I.'s position as the world's largest manufacturer of plasticizer alcohols.

General Rubber Goods

The Triple A. Rubber Co. (Pty.) Ltd., 231 Chamberlain Road, Jacobs, Natal, is embarking upon the production of oil seals, sponge rubber gaskets, pipe joints, suitcase handles, chair shoes and plugs, using natural, synthetic and sponge rubber. A number of items are also being made for the domestic trade, such as fishing sinkers, mats, rakes, window ledges and door stops, and for cold storage plants special rubber curtains designed to keep in the cold air when refrigerator doors have to be opened.



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OVERSEAS AGENTS THROUGHOUT THE WORLD

P.2806

Polythene

PART V—ELECTRICAL APPLICATIONS

(Continued from February 27 issue, page 308)

By L. HINDS, Ph.D., B.Sc., A.R.C.S. (I.C.I. Ltd.).

SINCE the very early days of polythene it has been appreciated that its electrical properties are outstanding in several respects. The first use found for polythene was in submarine cables, in which its low power factor and low permittivity combined with water resistance and flexibility, made polythene an outstanding choice as the insulant.

During the war, developments were mainly in radar cables and insulators; since that time, alongside the spectacular developments in moulding and film, the UK consumption of polythene for electrical applications has grown to about 5,500 tons per year.

The greater part of this tonnage is used in cables—submarine telephone cables, underground power cables, aerial and submarine power cables, Post Office telephone distribution cables, house-wiring, radio and television land-lines.

The permittivity of polythene (2.29) is lower than that of any other commonly used insulation material; it has an extremely low power factor (tan $\delta < 0.0002$ at all frequencies up to 10^4mc./sec.), and these properties together with a very high volume resistivity have led to the choice of polythene as a replacement for gutta percha in long distance telegraph cables. Because polythene can be made under closely-controlled conditions and its electrical properties do not vary, it can be relied upon for uniformity of performance which is particularly desirable for long distance cables. The use of polythene insulation and the development of underwater repeaters have made long-distance telephone cables possible. Polythene retains its excellent transmission characteristics even when submerged in deep seas, where pressures can be as high as several tons per square inch, and a transatlantic telephone cable, laid in 1956, fully fulfilled its promise and is to be followed by a second link between this country and North America in the near future. This new cable is described below.

In other applications, polythene has shown itself to be an insulant with excellent commercial possibilities, although the developments have not been so spectacular as in submarine cables. For power cables, its excellent breakdown voltage characteristics have led it to be tried out extensively; polythene-insulated power cables have given excellent performance in conditions involving corrosion, exposure to water and vibration, and several important installations have been made. Development in its use in telephone cables, both as an insulation and as sheathing, has taken place, again because of its excellent electrical characteristics and resistance to moisture and corrosion. There has also been a development of the use of polythene with a cellular structure where it is important to have an insulation with even lower permittivity than that given by solid polythene. Recent developments in these applications are reviewed below.

The physical properties of high density polythene and polypropylene make these materials attractive to the cable-maker. Their improved mechanical properties, abrasion-resistance, and resistance to deformation at high temperature, should enable the cable designer to reduce the cost of most cables either by a reduction in raw-material usage or by increasing the rating of a given size of cable. High density polythenes, provided they are free from catalyst residues, have very similar electrical properties to low density polythene. Polypropylene, however, has a slightly lower dielectric constant (2.2) and a higher power factor (tan $\delta = 0.001$); the dielectric strength is the same as that of polythene.

Both materials are in the early stages of development in the cable industry and hold great promise. To establish them alongside conventional polythene as accepted raw materials for cables will require many years of extensive evaluations both in the laboratory and in the field under service conditions.

Submarine Telephone Cable Developments

Within a few months of the laying of the first transatlantic telephone cable in 1956, telephone traffic across the Atlantic had doubled in volume. This cable, between Scotland and Newfoundland, can carry 36 simultaneous telephone conversations, but already the demand for transatlantic telephone time exceeds this and a new cable has been laid this year between France and Newfoundland. A third transatlantic cable is to be laid within the next two years between Scotland and Newfoundland to handle mainly the telephone traffic between the UK and Canada, and announcements have been made indicating that there will be extension of the world's submarine telephone cable systems in the near future.

Lightweight Cable Construction

One of the most interesting developments in submarine cable technology will be seen in the lightweight deep-sea sections of the transatlantic cable to be laid during the next two years between Scotland and Newfoundland.

In the past, heavy armouring has protected submarine cables in shallow waters from the effects of tidal movements and turbulent waters; the armouring also gave the cable sufficient strength in tension to withstand laying and recovery. In deep-sea sections the armouring had no protective function and the idea was conceived of placing at the centre of the cable—within the inner conductor—a strength-member of very high tensile strength steel so stranded as to have no tendency to twist in tension.

In the construction of the lightweight cable, Fig. 8, the use of external armouring has been eliminated altogether. Some 1,475 nautical miles of this cable will have this construction and the saving in weight and cost is expected to be considerable.

The strength in tension of the cable is provided by the core: this consists of a swaged heart of steel wires with an outer layer of steel wires. Round the core of the cable is a copper tape (longitudinally box-seamed), forming the inner conductor of the cable which is of the usual co-axial construction. The polythene insulation is extruded over the central conductor, giving a diameter of 0.990in. The outer conductor is formed from a series of annealed aluminium tapes wound-on

helically. Over this is wound a polythene film tape followed by an aluminium screen protected by an impregnated textile anti-corrosion tape. The cable is overall sheathed with the same polythene compound as that used for the insulation.

The polythene used in this cable has a melt flow index of 0.3 as in the previous cable, and is compounded with antioxidant and butyl rubber. The polythene is subjected to stringent testing, particularly electrical testing, before the extrusion process takes place, and was chosen in order to give the best combination of mechanical properties, particularly toughness, for an installation which has to remain serviceable for at least 20 years.

The polythene used in the cable will be made by Imperial Chemical Industries Ltd., and by its associate in Canada, Canadian Industries Ltd. The cables will be made by Submarine Cables Ltd., a firm jointly owned by Siemens Edison Swan Ltd. and the Telegraph Construction and Maintenance Co. Ltd.

The overall diameter of the new cable is about the same as that of the conventional armoured cable, but its weight in air is about two-thirds, and in water only one-third, of that of the older cable. The transmission characteristics of the cable are such that the whole system is designed to handle 60 channels whereas the first cable handled only 36 channels. A point worth emphasizing is that there is no armouring in the cable, and the centre steel strand which forms the strength-member is protected from the corrosion effect of the sea water by the polythene insulation. In shallow waters, a cable of the more conventional armoured type will be used.

Post Office Telephone Distribution Cable

Telephone cables from subscribers to telephone exchanges are collected together in cables which may contain up to 1,800 pairs of insulated wires. The standard insulation used in this type of cable is dry paper, and in order to preserve the insulation characteristics, the whole cable is sheathed with lead. This makes the cable heavy and difficult to handle, and the use of lead is undesirable because it is difficult to protect adequately from corrosion; also, it easily suffers mechanical damage and any resulting ingress of water causes complete breakdown of the cable. There have also been difficulties in the past with the supply and cost of lead.

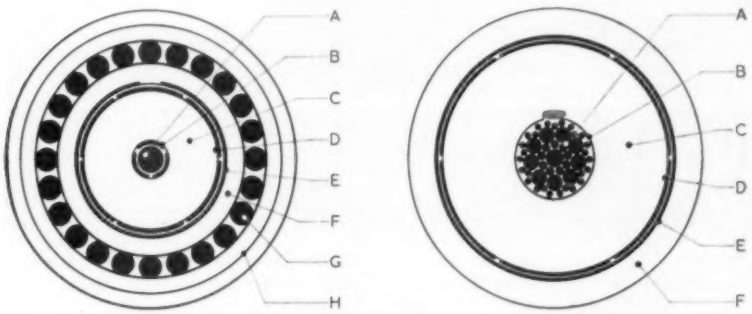

Fig. 8. (*Left*) **Structure of the first transatlantic telephone cable (deep-water type). A: Copper centre wire. B: Copper surround tapes. C: Polythene insulation. D: Copper return tapes. E: Copper teredo tape and treated cotton tape. F: Jute bedding with binding string. G: Cotton-covered armour wires. H: Tarred jute serving (protective layers).** (*Right*) **Structure of the new lightweight unarmoured cable. A: Torsionally balanced steel strands (strength-member). B: Inner conductor—copper tape. C: Polythene insulation. D: Return conductor—aluminium tape. E: Insulating and screening tapes. F: Polythene sheath**

The use of a polythene sheath over paper-insulated wires gives advantages in lightness and flexibility, but the life of such a cable would not be so long as that of a lead-sheathed cable because of the slow permeation of moisture vapour through the polythene causing deterioration of the insulation characteristics of the paper. If polythene is used to replace the dry paper, then a cable results which is virtually immune to troubles arising from water penetration or ingress of water resulting from mechanical damage of the sheath. The Post Office has therefore been introducing such cables on an increasing scale during the past few years, and their adoption will become more widespread as experience is gained in manufacture and installation.

Developments are required to evolve improved jointing techniques in the field, but the all-polythene cable has the advantage of being available in longer lengths than the lead-sheathed type. Corrosion troubles are non-existent with the polythene type, and the use of polythene/butyl rubber compound for the sheath has prevented the occurrence of cracking when cables are drawn through ducts. (The lubricants used for this drawing operation can cause environmental stress-cracking in polythene alone.)

Polythene-insulated Power Cables

Interest has developed in the use of polythene for power cables because of its high dielectric strength. The figures for this property, however, are much dependent on the method of test, and it is not possible to use the maximum figures for the design of cables. It is now appreciated that this difficulty arises from the fact that it is not easy to make a cable free from voids, particularly at conductor/polythene interfaces, and at high voltages, discharge can occur in these spaces causing rapid deterioration of the polythene insulation.

Improved extrusion techniques for insulating wires with the thick insulation required for power cables, together with improvements in their design, have led to an important commercial development of this type of cable, mainly for 11 and 15 kilovolt services. Such cables have the advantage of lightness, flexibility, freedom from corrosion and attack by moisture, and they are not subject to fatigue-failure in services where vibrational movement is possible, as are lead-sheathed cables. The cables are particularly suitable for use in submarine power-distribution. However, the uncertainty as to the life of polythene-insulated power cables and the limited experience so far obtained, has led to rather a slow development of this application. With further development of manufacturing techniques and more confidence in the performance of these cables resulting from the experience being gained, there will undoubtedly be further development, although it may well be relatively slow.

Expanded Polythene Insulation

In some cables where the minimum possible attenuation is required, the insulation is often given a composite structure embodying considerable quantities of air; the overall dielectric constant is then intermediate between those of air and polythene. Such cables are not easy or cheap to make, as they have in the past employed

moulded spacers to separate the inner from the outer conductors of a coaxial system. In some applications, it has been found easier to use expanded polythene, particularly where the overall diameter of the cable is small. An expanded or cellular polythene is made by incorporating in the polythene a compound which, when subjected to heat, decomposes to give gases which form bubbles in the melt which, when cooled, has a structure consisting of non-interconnecting cells. In this way, a permittivity of between 1.4 and 1.8 can be selected according to the application envisaged. Cables using this type of insulation are employed in many ways. For instance, the more efficient aerial lead-in required for television sets working on Band 3 or in fringe areas use cellular polythene insulation in a coaxial construction. A new development is the use of cellular material for certain trunk telephone cables, where multi-channel transmission is used. Certain television equipment cables have also been made based on this type of insulation.

Consideration has been given to the possibility of making more efficient distribution cables using expanded polythene insulation, but it is somewhat fragile for this purpose and the availability of the high density polythenes and polypropylenes with their improved mechanical properties are of interest in this field generally.

(To be continued)

Joint Sealing and Waterproofing

Expandite South Africa (Pty.) Ltd., Booysens Reserve, Johannesburg, estimate that between 1954 and 1959 their sales in South Africa of joint-sealing and waterproofing products have gone up 1,500%. This has demanded several large extensions of the company's manufacturing facilities. The South African company was only formed in 1954 and since then its products have won general acceptance in the Union. These materials have been used in the construction of major airports in South Africa, in several large water schemes, and in particular the Rand Water Board's 20,000,000 gallon North Ridge reservoir. The company expects that eventually it will be manufacturing its entire range of products in the South African factory. At the present time about half of the range is made locally.

The seventh 'Salon International des Plastiques' will be held at Oyonnax, Ain, France, from June 15-20 1960.

Plastics for High Temperatures

HIGH PRIORITY PROJECTS

INDUSTRY as a whole will benefit from research now going on into the production of new plastics and other materials able to resist the extremely high temperatures required for rocket and other high-speed space flight projects, said Dr V. E. Yarsley, of Yarsley Research Laboratories Ltd., in a lecture on 'Plastics for High Temperatures' at the conference run concurrently with the recent Engineering Materials and Design Exhibition.

It was clear, said Dr Yarsley, that in the aircraft and space-craft field, plastics had a tough assignment and it was likely that it would meet equally tough competition from ceramics and special metals. But even if the semi-inorganic or inorganic polymers did not attain significant heat resistance beyond the 1,000°F. already attained, the knowledge now being gained of the mechanics of both the building up and the breaking down of polymers at those high temperatures must be of 'enormous advantage' to the plastics industry and to the many industries which it served.

In another paper, on reinforced plastics, Mr A. W. Thompson (Bristol Aircraft Ltd.) said that present indications were that a long period of research and development were now about to bear fruit in a general expansion in many fields, and reinforced plastics would soon become commonplace in the consumer field. In general engineering, their use was already growing rapidly. The industry, founded only 15 years ago, already produced goods to the value of several millions of pounds each year.

During the year, there would be increased use of two new types. One of these was a plastics foam stabilized 'sandwich' structure with rigidity, toughness, strength and insulation properties 'nothing less than extraordinary' compared with those of a single skin laminate. With production costs at an attractive level, it could be used for such purposes as boat hulls or freight containers.

The other was a high-strength filament-wound structure in pressure vessel and pipe work, which would mark the beginning of the use of the material for highly-stressed engineering work.

Following the Albright and Wilson takeover of A. Boake, Roberts and Co., F. G. Pentecost, chairman of Boake Roberts, has been appointed a director of Albright and Wilson.

A single truck tyre, that will replace conventional dual equipment, is checked for tread temperature by Firestone engineer, W. R. Woodall. This new tyre, currently being developed by Firestone Tire and Rubber Company, Akron, Ohio, requires considerably less space than a dual and features a lower spring rate—giving a softer ride and better load cushioning

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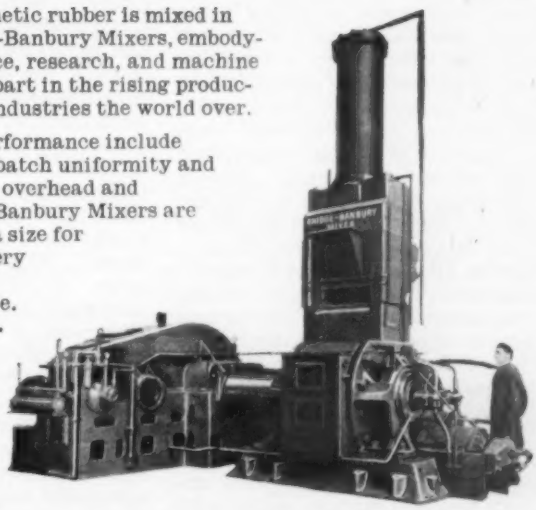

Fully detailed technical information is freely available on request.

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Crystallization-Inhibited Natural Rubber

PRODUCTION BY REACTION WITH BUTADIENE SULPHONE

By P. McL. SWIFT (BRPRA)

THE ability of natural rubber to crystallize is commonly beneficial in conferring high gum strength, but may under certain circumstances be disadvantageous. When stored at moderately low temperature natural rubber slowly crystallizes and becomes hard and inelastic—a phenomenon familiarly evident in 'frozen' raw rubber. Vulcanized natural rubber crystallizes still more slowly, but sufficiently rapidly at sub-zero temperatures (0°C. to −40°C.) to lead to serious loss in elastic properties after quite short storage times or if subject to strain conditions. In this article methods of modifying natural rubber to retard the rate of crystallization several hundredfold are briefly described.

Much data has been reported on the factors which influence the rate of crystallization of natural rubber, *i.e.*, temperature[1 2 3] extension[4], presence of impurities[5] and fillers[6], and the extent and type of vulcanization[2 3 4]. Gent, in a series of papers[3-7], has shown that the observed effects are consistent with a theory in which the rate of crystallization depends on the rate of formation of crystal nuclei. In particular it was inferred[2 4] that the presence of foreign groups along the rubber chain would impede nucleation, and hence reduce the rate of crystallization. Foreign groups could be cross-links, sulphur-containing side groups introduced during vulcanization[2], or chemically attached side groups[7]. Reaction between natural rubber and thiol acids in solution[8], in latex[8] or on the mill[9], aimed at producing the latter side groups, has proved successful in leading to retardation of crystallization[7], in some cases with quite surprisingly high efficiency. From these results and from studies of reactions of thiol acids with olefinic model compounds[10], it became apparent[8] that during these reactions some of the *cis* double bonds of the rubber chain were isomerized to the *trans* configuration. It has been shown[10 11 12] that this *cis-trans* isomerization can also be produced by the action of small amounts of sulphur dioxide acting on natural rubber at a temperature sufficiently high that chemical combination does not occur, *i.e.* above the ceiling temperature (*e.g.* in the range 140-185°C.). Methods for carrying out this reaction are described below, using a solid as a source of sulphur dioxide. A more complete account will be found elsewhere[13 14].

It is necessary accurately to characterize the resistance to crystallization of rubber modified in this way. A suitable test has been described by Gent[6] in which a T.50 test-piece is held at 150% elongation at −26°C. The retractive force exerted by the test-piece, measured by a calibrated spring, decreases with time as the rubber becomes more crystalline. Convenient characterization is by the *crystallization half (or quarter) life*, *i.e.*, the time taken for half (or one quarter) of the retractive force to be lost, or by the *retardation ratio*, *i.e.*, the ratio of the crystallization life of modified rubber to that of unmodified rubber. The temperature of −26°C. is that at which natural rubber crystallizes most rapidly. At the extension of 150% (for gum rubber) the speed of crystallization is increased without interference with the test by crystallization such as is produced by stretching to higher elongations[6]. A lower elongation may have to be used with filled compounds. A TMT-sulphurless vulcanizate of ordinary natural rubber has a quarter-life of about 50 minutes, and a CBS-accelerated sulphur vulcanizate a quarter-life of about 3,000 minutes. For a modified rubber of retardation ratio 100:1 these lives are increased one hundredfold, *i.e.* to about four days and thirty weeks respectively. This retardation ratio of 100:1 has been taken as that which will give an adequately long storage life in CBS-accelerated sulphur vulcanizates. An MBT-accelerated sulphur vulcanizate may have a longer life.

Isomerization Reaction

Three methods of carrying out the isomerization reaction have been used, *i.e.* reaction in a particular type of internal mixer, in a slightly modified extruder, and in the press concurrently with a peroxide cure. In all these, a convenient source of sulphur dioxide is butadiene sulphone.† In the mixer and extruder, the reaction is rendered more efficient by addition also of CHDN‡ (1-1′-azo-bis-1-cyclohexane nitrile), which is without effect in the peroxide cure. Provision of suitable fume extraction arrangements is necessary.

Procedure in the Internal Mixer

On a 1lb. scale the reaction has been conducted efficiently in a Banbury mixer, but on a larger, 40lb., scale a Baker Perkins Universal Masticator has been used* because in this type of machine it is easier to retain sulphur dioxide. The two reagents, butadiene sulphone and CHDN, are added separately in masterbatches because more efficient reaction is obtained in this way. Table 1 gives the compositions of the masterbatch used in a suitable mixing procedure. A fine silica filler is used as a carrier for the reagents to facilitate mixing.

TABLE 1
FORMULAE OF MASTERBATCHES

	Mixer			Extruder
	M_1	M_2	M_3	E
RSS ..	85	5	10	100
CHDN ..	—	0.75	—	0.4
Butadiene sulphone	—	—	1.5	1.5
Fine silica	—	0.25	2	2.0

A suitable reaction procedure is as follows:

1. Prepare M_2 on mill or in internal mixer at a rubber temperature below 100°C.
2. Prepare M_3 similarly.
3. Charge M_1 to the hot masticator with 50-60lb. steam on the machine, and masticate two minutes with the ram down.
4. Charge M_2 to the masticator and mix for a further two minutes with the ram down. After this stage the temperature of the rubber should be at least 170°C.
5. Charge M_3 to the masticator and mix for a further 10 minutes with the ram down. Dump on to a cool mill. The dump temperature should be 175°-185°C.

Materials made in this manner have consistently had retardation ratios of

* At Baker-Perkins Ltd., Peterborough, and at Rubber Technical Developments Ltd., Bridge Road, Welwyn Garden City.

†Obtainable from Whiffens Ltd.

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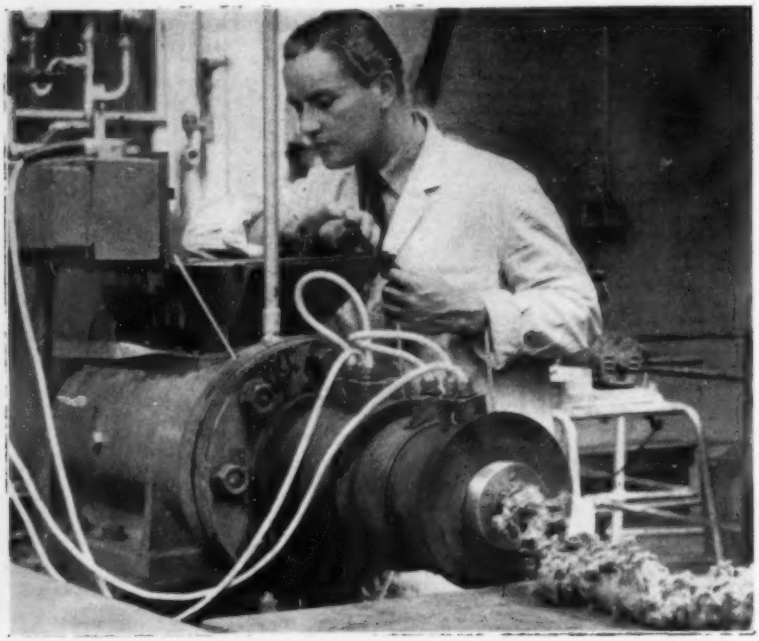
several hundred to one, and Mooney viscosities of 45-60.

Lower temperatures than those indicated above necessitate longer reaction times. Increasing the proportion of butadiene sulphone increases speed of reaction but renders the mixing of the masterbatch more difficult and more sulphur dioxide is evolved. The proportion of CHDN should not be below 0.4 phr, but greater amounts have little additional effect.



Production of crystallization-inhibited natural rubber in a modified 3-in. extruder

Procedure in the Extruder

Using the mix E in Table 1 it is necessary to secure a dwell time in the extruder of about four minutes at 170°C. to give a retardation ratio greater than 100:1. At lower temperatures longer times are necessary, and though the reaction time may be reduced by raising the temperature, in practice, with the apparatus employed, temperature control was easier in the range 170-175°C. At temperatures above 185°C. the product rapidly becomes both degraded and gelled. A change in reaction time at one temperature affects the retardation ratio greatly (Table 2).

TABLE 2

RETARDATION RATIO AND DWELL TIME IN A MODIFIED EXTRUDER

Dwell time, min. at 170°C.	2½	3½	6½
Retardation ratio	20	600	2,000

A dwell time of four minutes is longer than is usual in many rubber extruders. In experimental work* a 3in. rubber extruder was furnished with an extension head 20in. long and 3in. in diameter. A baffle plate with thirteen ¼in. diam. holes placed immediately behind a 1in. circular die secured homogeneous reaction and gave better temperature control. The extension head was electrically heated by ring heaters. In a typical procedure the mix E of Table 1 is prepared on a mill or in an internal mixer, only a coarse dispersion of the additives being necessary. The mix is then fed into the extruder as usual and after passage through the extruder is cooled and consolidated on a mill. This procedure, with a dwell time of four minutes at 170-175°C., gives 60lb./hr. of rubber with a retardation ratio of several hundred to one, and Mooney viscosity 55-70. Picture shows the extruder with the extension head fitted, and the typical appearance of the modified rubber as it emerges from the die.

A proportion of butadiene sulphone greater than 1.5 phr cannot easily be used in the extruder because it leads to troublesome slipping in the feed. In contrast to the process in the mixer, increasing the proportion of CHDN increases not only the efficiency of the reaction but also the amount of cross-linking in the modified rubber. 0.4 phr of CHDN gives both efficient reaction and easy processing subsequently.

Properties of Modified Natural Rubbers

Crystallization inhibited (CI) natural rubber prepared in the extruder or internal mixer has physical properties little different from that of unmodified natural rubber and may be compounded and cured normally, with two provisos: first, CI rubber breaks down rather more rapidly during mixing, and secondly, oven ageing is somewhat inferior. The latter point is effectively dealt with by increasing the proportion of conventional antioxidant. Rate of cure, hardness, modulus at low elongations, and compression set are normal, modulus at higher elongations and tensile strength are 10-15% lower than those of similar natural rubber compounds. Flex-cracking resistance is rather better than that of natural rubber. Table 3 gives some properties of a gum compound and an HAF black filled compound.

Modification During Peroxide Cure

The isomerization reaction will proceed conveniently during peroxide vulcanization, with a slight retardation of cure. In other curing systems, both isomerization and vulcanization reactions are almost completely inhibited.

TABLE 3

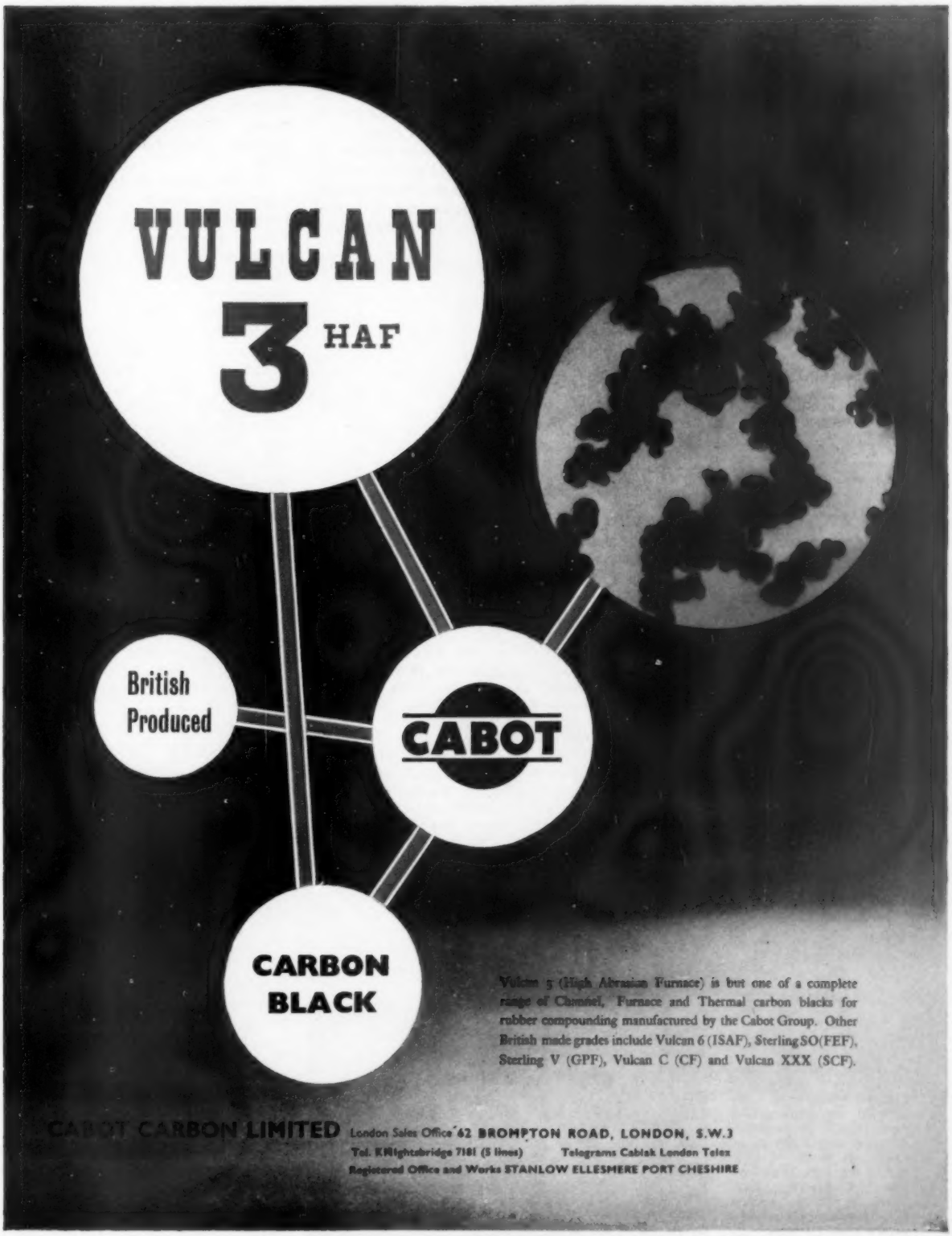
SOME PROPERTIES OF CRYSTALLIZATION-INHIBITED RUBBER MADE IN THE INTERNAL MIXER OR EXTRUDER

Crystallization-inhibited NR of retardation ratio 120/1	100	—	100	—
Smoked sheet	—	100	—	100
Zinc oxide	5	5	5	5
Stearic acid	1	1	3	3
Antioxidant	1	1	2	1
Sulphur	3	3	2.5	2.5
CBS	0.7	0.7	0.7	0.7
HAF black	—	—	45	45
Cure	40/140°C.	40/140°C.	30/140°C.	30/140°C.
Crystallization quarter-life	>20 wks.	2 days	>20 wks.	2 days
Tensile strength kg/cm²	243	275	200	246
Elongation at break	710	700	370	380
M100	9	9	32	31
M300	23	22	146	169
Flex cracking resistance,* Kc to stage C	—	—	81.5	67.0
Compression set†	2.5%	2.5%	5.2%	4.9%

* De Mattia flex resistance, BS903, Pt. A10, 1956.

† After 30 minutes' rest, BS903, Pt. 18, 1950, Section 18.4.

* At Rubber Technical Developments Ltd., 78 Bridge Road East, Welwyn Garden City.



Vulcan 3 (High Abrasion Furnace) is but one of a complete range of Channel, Furnace and Thermal carbon blacks for rubber compounding manufactured by the Cabot Group. Other British made grades include Vulcan 6 (ISAF), Sterling SO (FEF), Sterling V (GPF), Vulcan C (CF) and Vulcan XXX (SCF).

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There are some limitations on the compounding ingredients which can be added. Conventional antioxidants are without effect, except for the usual observation that some of them retard the peroxide cure. Among blacks, HAF, FEF and to a lesser extent MPC black, can be used; other blacks greatly reduce the crystallization life. Among white fillers, clay and whiting can be used, but not reinforcing silicas. The addition of CHDN has no effect.

Some properties of gum and black mixes are given in Table 4; further details will be given elsewhere. The gum stock was mixed on a mill at about 60-70°C. roll temperature, the black mix was made in an internal mixer with dicumyl peroxide and butadiene sulphone being added subsequently on the mill at about 60-70°C. The proportion of butadiene sulphone used was 1.5 phr. Long crystallization lives are also obtained with 1.0 phr or 0.5 phr of butadiene sulphone. By increasing the proportion of butadiene sulphone to 3 phr a gum vulcanizate is obtained which is weak and short-breaking, like a gum styrene-butadiene rubber, but the black vulcanizate is considerably reinforced. It is remarkable that even with this high concentration of butadiene sulphone no blowing or flaws due to liberated gases have been detected in sections 1in. thick of a highly-plasticized compound.

The compounds noted in Table 4, containing 1.5 phr of butadiene sulphone, are similar in properties to an unmodified peroxide cured compound. Subject to the restrictions on compounding noted above, reaction during peroxide cure offers a convenient way of manufacturing articles in crystallization inhibited rubber.

To conclude, it has been possible to readily modify natural rubber to confer great resistance to crystallization; the product may be utilized in normal compounds to give vulcanizates with good mechanical properties which differ little from those of unmodified rubber.

TABLE 4

SOME PROPERTIES OF CRYSTALLIZATION-INHIBITED RUBBER WHEN THE REACTION IS PERFORMED DURING PEROXIDE CURE

RSS	100	100	100	100
DiCup	3	3	3	3
Butadiene sulphone	0	1.5	0	1.5
Silica VN3	0	2	0	2
HAF black	—	—	40	40
Cure	50/140°C.	60/140°C.	50/140°C.	70/140°C.
Crystallization quarter-life	50 min.	>>20 wks.	50 min.	>>20 wks.
Tensile strength kg/cm²	190	130	195	150
Elongation at break	740	770	340	325
M100	5	5	17	17
Compression set	3.3%	2.9%	5.5	4.1
Resilience	86%	86%	74%	74%

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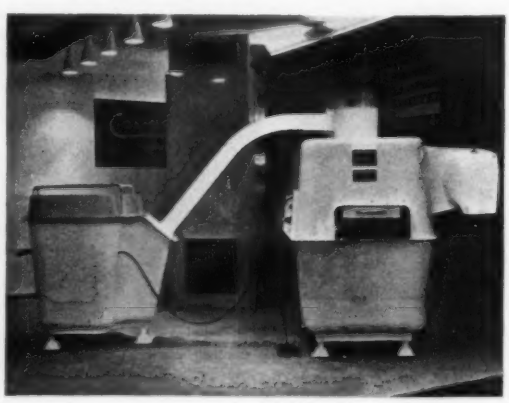
[13]Cunneen, Swift and Watson, *Trans. Inst. Rubber Ind.*, in press.
[14]BRPRA Technical Bulletin No. 4.



A fruit washing and cleaning machine, housed entirely in Cellobond polyester/glass and which is capable of receiving 1,200 lb of fruit per hour, is now being manufactured by John Colinsons Ltd. This machine, called the 'Aquazone,' separates, washes and extracts foreign matter from dried sultanas, currants and similar fruit and will receive amounts up to 50 lb

POLYMERIC PROGRESS

The Plastics Institute conference to be held at London University on March 30 and 31 1960, has met with a world-wide response and applications have been received from Belgium, France, East and West Germany, Holland, Hungary, Italy, Sweden, Switzerland, USSR, and USA.

At the dinner to be held at the Connaught Rooms on March 30, Professor Sir Robert Robinson, O.M., F.R.S., will propose the toast of the Institute, and Mr F. J. Erroll, M.P., Minister of State, the Board of Trade, the toast of the plastics industry and the overseas visitors.

The final programme for the conference will be as follows. Wednesday March 30 1960: Methods. J. R. Whinfield, C.B.E., M.A., F.R.I.C. (I.C.I. Ltd.). A one-hour paper laying the foundations for the day's proceedings. Professor G. Gee, Sc.D., F.R.S. (University of Manchester), 'Newer Methods of Polymerization.' G. Bier, Dipl.Chem., Dr.Phil. (Farbwerke Hoechst A.G.), 'A New Polymerization Technique with Ziegler Catalysts.' H. M. Stanley, M.Sc., Ph.D. (Distillers), 'The Impact on the Plastics Industry of Developments in Petrochemicals.' Dinner at the Connaught Rooms, London, W.C.2.

Thursday March 31 1960: Materials. Professor H. F. Mark and Professor M. Goodman (Polytechnic Institute of Brooklyn, USA), 'New Polymers: New Problems.' (Paper to be presented by Professor M. Goodman.) N. J. L. Megson, D.Sc., F.R.I.C., F.P.I. (Ministry of Aviation), 'High - Temperature Resistant Materials.' W. Henry Linton, Sc.D. (du Pont, USA), 'Acetal Polymers.' H. Schnell, Dr.Rer.Nat. (Farbenfabriken Bayer A.G.), 'Polyesters of Carbonic Acid.' H. C. Raine, M.A. (I.C.I. Ltd.), "Polyolefins.'

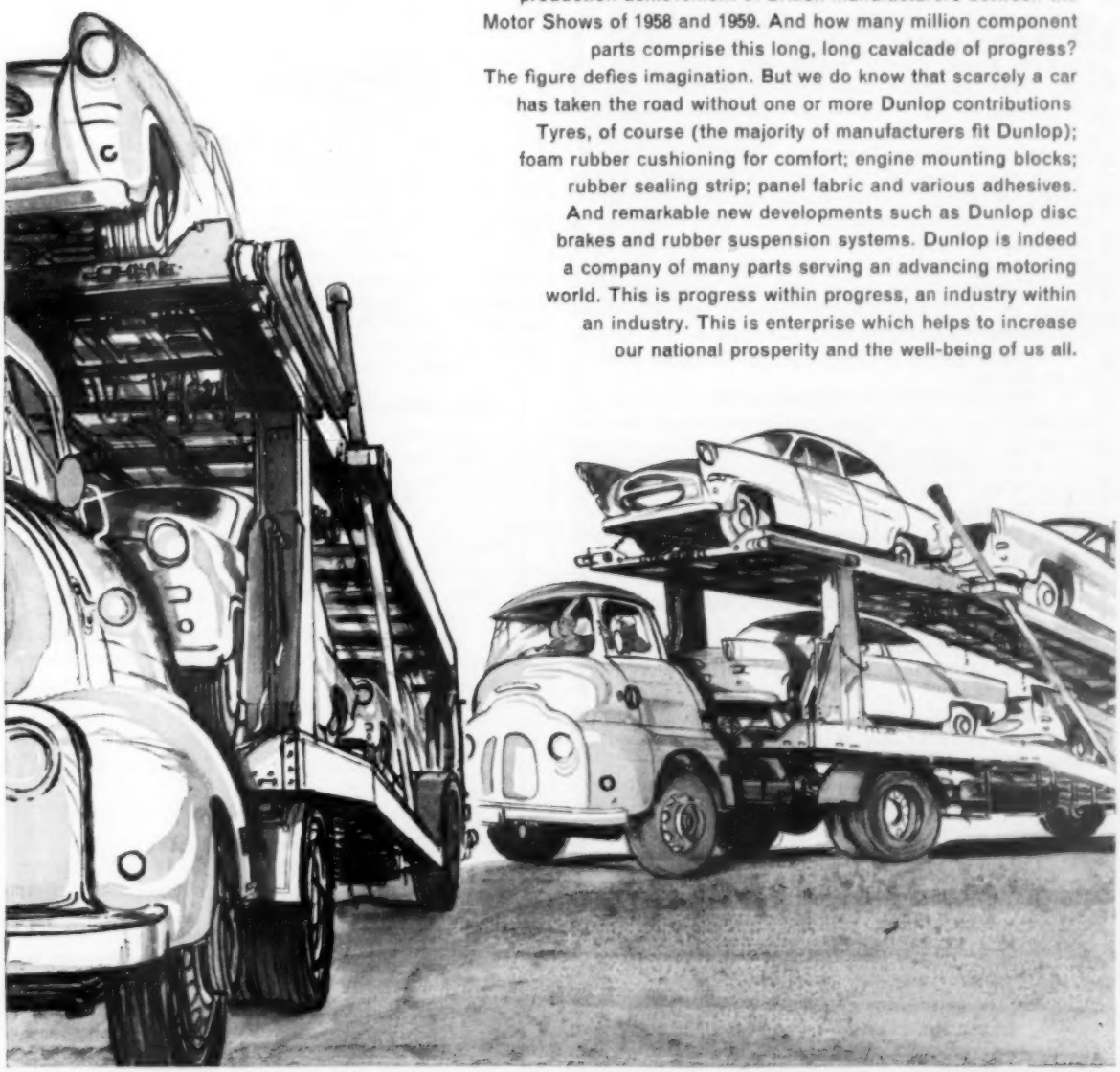
PRIZE PACKAGING

Some of the films and semi-converted packaging materials used in the manufacture of 15 packages which won prizes at the recent US National Flexible Packaging Association competition are now being sold in Britain by Dow Chemical Co. (UK) Ltd.

Two of these films are Trycite—highly transparent polystyrene film—which is said to be effective as an economical overwrap for produce and gift paper and as windows for window envelopes, bags and cartons; and Saran Wrap, whose chemical resistance and strength make it suitable as a protection against flavour loss or contamination and against moisture loss or gain.

COMPONENTS OF PROGRESS...

More than a million cars from the assembly lines . . . more than half-a-million for the export markets. That is the fantastic production achievement of British manufacturers between the Motor Shows of 1958 and 1959. And how many million component parts comprise this long, long cavalcade of progress? The figure defies imagination. But we do know that scarcely a car has taken the road without one or more Dunlop contributions Tyres, of course (the majority of manufacturers fit Dunlop); foam rubber cushioning for comfort; engine mounting blocks; rubber sealing strip; panel fabric and various adhesives. And remarkable new developments such as Dunlop disc brakes and rubber suspension systems. Dunlop is indeed a company of many parts serving an advancing motoring world. This is progress within progress, an industry within an industry. This is enterprise which helps to increase our national prosperity and the well-being of us all.



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VIEWS and REVIEWS

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **Dr Schidrowitz**

Metal Fluoride Fillers

AN investigation of various metal fluorides as fillers for fluorine-containing copolymers is described in a paper in *Soviet Rubber Technology*, December 1959, pages 28-33 (translated from *Kauchuk i Rezina*, Vol. 18, No. 7, July 1959). The authors are F. A. Galil-Ogly, I. A. Skuba and A. S. Novikov, of the Scientific-Research Institute of the Rubber Industry.

This study covered the fluorides of lithium, zinc, barium, magnesium, strontium, calcium and aluminium, obtained by reacting hydrofluoric acid with soluble salts of the respective metals. The effects of the metal fluorides were evaluated from the tensile properties and heat stability of vulcanizates compared with those of a vulcanizate containing the silica filler currently used in peroxide-cured fluorine-containing copolymers.

The conclusions of the authors from the results obtained are as follows:

1. 'The fluorides of calcium, magnesium, strontium and aluminium are active fillers for vulcanizates of fluorine-containing rubbers. In their reinforcing effect they are inferior to silica filler, but produce vulcanizates with greater heat-stability.'

2. 'Of the metal fluorides studied the most active are calcium fluoride and magnesium fluoride. The reinforcing activity of metal fluorides is determined by their specific surface area and particle structure.'

3. 'The activity of calcium fluoride depends on the nature of the initial raw material used for its preparation. The most active calcium fluoride is obtained from sodium fluoride or ammonium fluoride and calcium chloride or calcium oxide.'

4. 'Particles of active calcium fluoride have a porous surface, are 0.01-0.1 micron in size and have a specific surface area of 32-27m.^{2}/g.'

5. 'The activity of calcium fluoride as a heat-stable filler depends on the mix formula and method of vulcanization.'

Drying of Sheet Rubber

The Journal of the Rubber Research Institute of Malaya (Vol. 16, Part 1, 1959) contains a paper which is a 'Survey of Factors involved in an Experimental Study of the Drying of Sheet Rubber.' The author is R. S. Gale of the Chemical Division of the RRI, Malaya. After referring briefly to prior studies on the drying of sheet rubber, the author observes: 'In reviewing the need for further work, it was clear that more information was required on the effects of temperature and humidity since a knowledge of these two variables is vital to an economic assessment of the drying process; it was also evident that accurate data could only be obtained by paying attention to the many other factors likely to affect the drying characteristics.'

The present paper covers 27 pages and the scope of the investigation is shown by the six sections into which the paper is divided: (1) Factors affecting dimensions of sheet rubber. (2) Effect of drying conditions on drying rate. (3) Effect of relative humidity on equilibrium water content. (4) Determination of the water content of sheet rubber. (5) Effect of drying conditions on blister formation. (6) Effect of drying conditions on technological properties.

The paper covers quite a lot of useful ground but it is only a preliminary to further work. In this connexion, I quote the final paragraph of the author's conclusions: 'Considerable attention has been devoted by the various research institutes in the East to the possibilities of new coagulation and preparative techniques, but it is clear that before the economics of a unified process can be assessed, further more detailed information is required on the effect of drying conditions on drying rates and quality. The present paper supplies data essential to the planning of the main programme designed to provide this information. The experimental part of this programme has already been carried out, but the analysis and assessment of the observations are not yet complete. It is hoped to publish the results of this further work in 1960.'

'Meraklon' Polypropylene Fibre

Further interesting information on 'Meraklon' polypropylene fibre is given in *Skinner's Silk and Rayon Record* ('The Journal of the Man-made Fibres Industry') for January 1960, page 39, from which the following particulars have been taken.

'Meraklon' is to be produced in Italy by the Montecatini group by a very low-cost process that promises, at this stage, to give a true synthetic fibre at a price directly competitive with the various regenerated cellulosics. The minimum prices for various man-made fibres, showing the relative position of 'Meraklon,' are as below:

Viscose rayon staple	1s. 10½d.
Acetate staple	3s. 0d.
Meraklon polypropylene	4s. 3d.
Triacetate staple	4s. 6d.
Acrylic staple	6s. 6d.
Polyamide staple	9s. 9d.
Polyester staple	10s. 0d.

Properties

'Meraklon' has the following properties:

(a) A very low specific weight—0.91—which gives exceptionally light fabrics with a remarkable surface covering power.
(b) A high tenacity and resistance to abrasion.
(c) Elasticity, resilience and creep comparable to the best synthetic fibres.
(d) High resistance to acids and alkalis.
(e) Complete resistance to mould, micro-organisms, insects, etc.
(f) Resistance to light and ageing between silk and polyamides, but it can be raised by adding of stabilizers.
(g) Practically no static electricity. This characteristic is of great importance for a smooth behaviour of the fibre all through the spinning and weaving processings and avoids 'pilling.'
(h) The ability to be machine washed.

Montecatini has on stream a yearly production of about 10 million lb. divided between staple fibre and continuous multifilament and monofilament yarns. This year, the total output will be raised to about 30 million lb.

PHILIP SCHIDROWITZ

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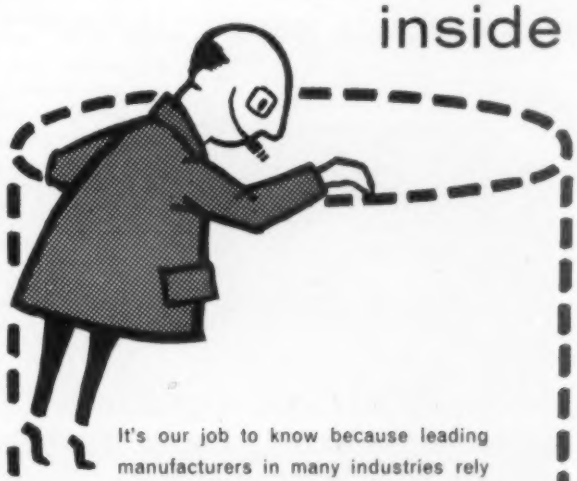

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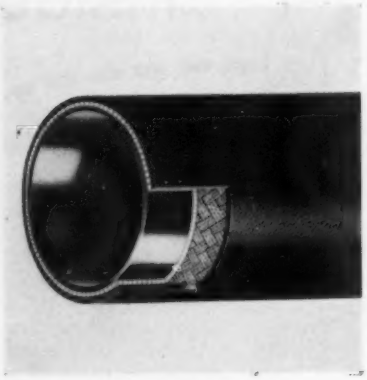
HEAVY DUTY HOSE

Recently developed for heavy duty, high pressure service is the Goodyear Fire Chemical Hose, which is specially designed for wash-down duties



and fire protection, including chemical foam, on tankers.

Manufactured in 50ft. or 60ft. lengths, the tube consists of a smooth, seamless and non-porous synthetic rubber which is claimed to have excellent resistance to ageing; the reinforcement is a braided, high tensile, synthetic fibre yarn. The outer cover is of synthetic rubber.

New PVC Plant

A £250,000 PLANT, capable of producing enough PVC to satisfy South African demand over the next 20 years, has been demonstrated at Somerset West by the Vynide Division of African Explosives and Chemical Industries Ltd. This material is being used increasingly in South Africa to make curtains and handbags and there may be a big potential use in lining farm dams. Local raincoat and dress manufacturers are using it and for other purposes fabrics with typically South African patterns are being supplied. Until the new machinery was installed, however, only PVC for the interior decoration of cars was made in South Africa, the rest being imported. Now that these other types are being made in Somerset West it is hoped to win a large portion of the local market and also to export to neighbouring territories. The machine is the only one of its kind in Africa.

For the fruit juice strainer attachment to their new built-in food centre —which has to resist constant contact with citric acid—Nutone of Cincinnati, Ohio, has chosen Cycolac thermo-plastic resin.

IRI London Celebrate

The annual dinner and dance of the London section of the IRI, held at the Café Royal, was a record—both for the number of guests present and the amount of enjoyment they received. Mr George Martin, chairman of the council, congratulated the dance committee on their arrangements. He said that whereas last year the guest list had been limited to 160, now there were 300 present.

Mr C. H. J. Avons, chairman of the London section, replying, said that he was sorry Sir John Dean could not be with them. Sir John, who had suddenly had to fly to Canada on urgent business, sent his apologies and best wishes to the section. Mr Avons welcomed all the guests and thanked members for their support. Although, he said, a certain section up north had had a very successful dinner-dance recently, he denied having received a take-over bid from this section.

Mr G. N. Welding proposed the toast of the ladies, and Mrs Avons replied demurely that it was pleasant to be appreciated—for once.

The rubber industry's generosity—or perhaps the dance committee's powers of persuasion—was shown in the large number of gifts that were distributed in the draw that followed. Thirty-four firms—from Anchor to James Walker—gave prizes for this and for a number of hilarious spot dances during the evening.

Dancing went with a swing to Bert Foxley and his Rythm Aces and one of the highlights of this thoroughly successful evening was when the balloon, or rather balloons, went up. An enormous net of what must surely have been one of the most varied collection of balloons ever assembled, was tipped up slowly over the dancers. Later, wives insisting that as many balloons as possible should be taken home as trophies, more than one well-known figure in the industry was seen in Regent Street with a large brightly-coloured bunch, trying to look inconspicuous while he hunted for a taxi.

Some of the personalities at the highly successful IRI London Section annual dinner and dance were *(facing page, left to right)*: **1. G. Martin (Chairman of the Council) and Mrs Martin, C. H. J. Avons (Chairman, London Section) and Mrs Avons. 2. F. J. Jansen (Col. Int.), E. Norvall, C. R. Botts (Col. Int.). 3. Mrs Midwinter, Mrs Purdue, V. Purdue (Chance and Hunt), E. L. Midwinter (I.C.I.). 4. J. R. Cassidy (Mechanical Rubber), J. Buxton (Runnymede Rubber), Mrs Buxton. 5. N. C. H. Humphreys (R. W. Greeff), Mrs Humphreys, Mrs Fiber, A. Fiber (Dupont UK). 6. Mrs McG. Morgan, S. R. Glover (Dunlop), Dr McG. Morgan, M. Arends. 7. Mrs Mernagh, L. R. Mernagh (Firestone), N. C. H. Humphreys (R. W. Greeff), Mrs Humphreys. 8. Mrs Sutton, S. D. Sutton (Veedip), Mrs Hardman, H. Hardman (Veedip). 9. C. S. Taylor (Veedip), Mrs Taylor, F. C. Starch (St. Helens Cable and Rubber), Mrs Starch. 10. S. G. Thorpe (J. Walker), J. Dow. 11. J. E. Davis (Veedip) D. Newcombe (Veedip). 12. Mrs Waugh, M. W. Waugh (Monsanto), Mr Bottard (Monsanto).**

Electricity at Efficiency Exhibition

Some of the many ways in which electric resistance heating is used in industry resulting in improved production and economy of fuel will be featured on the stand of the Electrical Development Association at the Fuel Efficiency Exhibition at Olympia, April 27-May 6.

The display will illustrate the use of industrial electric immersion heaters for melting metals and heating liquids, air and gases. The use of infra-red heated ovens will also be demonstrated, and charts and enlarged photographs will show how extensively it is used for industrial processes such as drying, paint storing, baking, pre-heating plastic moulding material and softening thermo-plastic material.

Beating Monotony

A new wall covering has just been introduced, mainly intended for the large wall areas which often tend to present a monotonous appearance. This is a system of tiling picked out with white outlines. The tiles—'Marleymura'—are 12in. x 5⅛in., in plain pastel tints and they are fixed to show ¼in. wide gauge jointing round each tile. Made of vinyl, two or more colours used together prove particularly effective, and half tiles can be introduced for added decoration.

The tiles are fixed with a special neoprene adhesive, and a right-angled gauge is used by the tiler, to leave an ¼in. gap between each tile. This gap is subsequently lined in with cellulose filler finished flush with the tiling.

IRI LONDON
ANNUAL DINNER AND DANCE

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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

ONE of the highlights of the past week was the evening spent at the National College of Rubber Technology last Friday when the Board of Governors held the sixth Convocation for the presentation of diplomas and prizes.

It was particularly pleasant to get to know even more at first hand of an industrial institution which, as we were reminded later, has made almost incredible strides during the ten years or so of its existence. It is not generally known, for example, that whereas the College was originally designed and equipped to accommodate 90 students, there were last year actually 123 of them, full time, on the lists, in addition to a large number of part-time students. I should not be surprised also to gather, in view of the spectacular successes which are still being attained, that a great many more will be glad of the opportunity of benefiting from the fine course of education and instruction which is available there.

An Impressive Gathering

It was an impressive gathering which assembled under the chairmanship of Mr H. Rogers, F.I.R.I., the chairman of the Board of Governors of the College, and we were all of us impressed by the report of Dr Cotton, the head, who, as will be seen elsewhere, dealt faithfully and at length with its achievements, putting the matter neatly when he pointed out that the College, from its infancy, has now reached puberty—the creative age of life.

I am sure everybody was disappointed when we were told that Sir John Dean, president of the Institution of the Rubber Industry and vice-president of the Plastics Institute, who was to have presented the diplomas and prizes—between 40 and 50 of them—had had, with Lady Dean, to leave this country on an urgent industrial trip abroad. But, with very much aplomb, and to the satisfaction of everybody, Dr T. J. Drakeley, stepped into the breach, and after handing out the diplomas and prizes gave a most admirable address, based in part upon the notes which Sir John had made from which to speak, and also upon his own long and intimate association with this form of industrial education.

Dr Drakeley has a happy faculty of using the right phrase, often with a touch of dry humour, and he delighted us all—the old stagers and the newcomers. One of the former remarked to me a few minutes after Dr Drakeley sat down that he was one of the most significant men in this new era of technical education.

The Practical Side

In the course of the evening I was to have my memories refreshed, and my knowledge expanded about the methods by which the practical and the technical, in rubber and plastics, are being brought together at the National College. Among the numerous members of the staff to whom I spoke was Mr Morris Kaufman, who is senior lecturer in plastics technology. His function is to organize the plastics department and to cater, for example, for those with university entrance qualifications linked up with the practical side. He pointed out to me how particularly useful it is to get graduates who have had training in the basic sciences, and who can build on it at the National College some clear technical knowledge of both the rubber and plastics industries. This is what Mr Kaufman is particularly concerned with in regard to plastics, although, of course, on the rubber side, he reminded me, the procedure has been in existence and developing for years.

In some respects, perhaps, this is one of the most important aspects of the work of the College. In the usual way, science students who, after graduating opt for industry, go to the factories and workshops with little or no practical knowledge or experience and in some cases it takes as much as a couple of years for him to gain it. I gathered that this college course enables the student, while graduating or as a post-graduate, to get this working background, and a tour of an hour or so of the College itself—the exhibits, demonstrations, and in particular what seemed to me to be the perfect example of a miniature rubber factory, must have made plain to the veriest tyro the tremendous benefits which the College, under Dr Cotton, and his numerous staff, has to offer.

Purely Personal

People on this side of the Atlantic particularly concerned with chemicals, plastics and rubber will be interested to hear that Mr William D. Eaton, director of finance and secretary of Du Pont de Nemours International S.A., has been appointed managing director and chairman as from March 1. Du Pont de Nemours International is a wholly-owned sales subsidiary of E. I. du Pont de Nemours and Co.

Mr Eaton succeeds Mr David H. Conklin who will concentrate on his responsibilities as European director of the parent company while remaining chairman of the boards of Du Pont's subsidiary companies in the UK, the Netherlands, and Belgium. Mr George C. Vennum, deputy director of finance and assistant secretary of Du Pont International, has been appointed to Mr Eaton's former position.

Viscount Chandos, whom we all knew so much better as Sir Oliver Lyttelton, particularly as president of the Board of Trade, and who is now again chief of AEI, has given distinguished service both in the chemical industry and its allied branches. Accordingly, the Society of Chemical Industry has awarded him the Messel Gold Medal, which is given every two years to a man of distinction in the industry, and it will be presented to him at the society's annual meeting on July 6 next at Bristol.

Major William Henry Cadman who has recently died at his home, The Orchard, Market Drayton, Shropshire, aged 79, was for a generation a figure of international significance in chemistry and chemical production. A younger brother of the first Lord Cadman, the great engineer, Major Cadman was specially known for his discoveries in regard to carbon black. While working for the Anglo-Persian Oil Co. in the Far East, he began his researches which solved the problem of production of carbon black in its modern form, and from 1930 until his retirement in 1948, he was at the head office in London of the Anglo-Iranian Oil Co.

There he was largely responsible, not only for the company's production of carbon black, but also for its work

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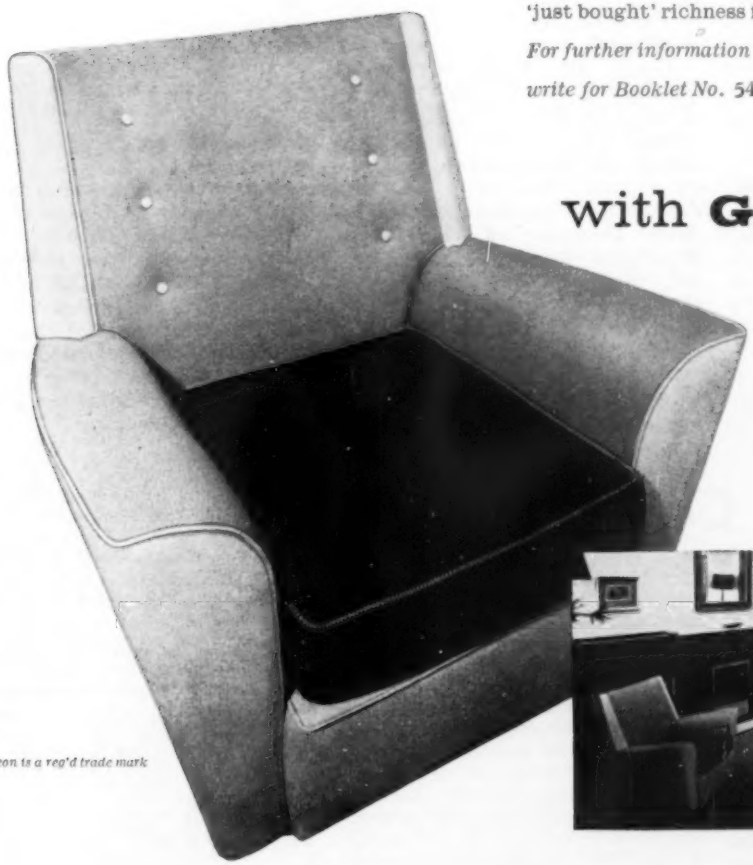

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associated with oils from coal and shale.

The New I.C.I. Set-up

In accordance with prior announcement as well as expectation, the Board of Directors of I.C.I., meeting in London last week, formally elected Mr Stanley Paul Chambers as chairman in succession to Sir Alexander Fleck, and the change became effective as from Tuesday last (March 1). A further change was the appointment of three gentlemen to take the place of Mr Chambers as deputy chairmen. They are Mr L. H. Williams, Mr E. A. Bingen and Dr R. Holroyd.

I have written about the two former before, but here is some interesting information about Mr Williams. He is a B.Sc. of London University, and much of his earlier career was spent with Naylor Bros., of Slough, which is in the paint division of I.C.I. By quite spectacular stages of promotion, Mr Williams went on from post to post until in 1949 he became division chairman. In 1957 he became a member of the main board, and now he is one of the triumvirate supporting Mr Chambers in the chairmanship.

The four gentlemen have got plenty of new work in front of them, especially in the development of the new Severnside site (*RJIP*, February 20).

Mr David Bridge

I regret to announce the death of Mr David Bridge, retired Joint Chairman of David Bridge and Co. Ltd. He died on Saturday February 20 within one day of his 80th birthday.

Mr Bridge was associated with the well-known Castleton firm for all his working life.

UAM London Area

The UAM Group has appointed an additional representative to the London area. From March 14, Mr P. L. Gargrave, who has been working for the past three months in the sales department at head office at Watford, will take over the London South-West and West postal districts. Mr F. M. Gomm will remain responsible for the London, S.W.1 and W.2 districts, while Mr W. Todd will be responsible for London, N.W., and Middlesex. All three representatives will be based on the UAM Group's London Area office at 8 Upper Grosvenor Street, W.1.

Du Pont Changes

Russell C. Nelson, marketing manager of the General Products Group of Du Pont de Nemours International S.A. (Du Pont's Swiss subsidiary), has been promoted to director of sales. Norman P. Rockwell, assistant to the export manager of Du Pont's Industrial and Biochemicals Department, has been transferred to the Swiss company as marketing manager for agricultural and industrial chemicals and will take over some of Mr Nelson's former duties.

Mr Nelson, who has had 16 years' experience in research and export sales with the Du Pont Company, will direct sales operations for products marketed by Du Pont de Nemours International, primarily in Europe, but also in the Middle East, Africa, the Far East, Australia, New Zealand, and the Philippines. These products include textile fibres, elastomers, plastics, agricultural and industrial chemicals, paints, and photographic products.

Those Picture Babies

More than once during the past few months I have been referring to that interesting Ecko 'Picture Baby' Competition which was organized last year and thrown open to all buyers of Ekco Gold Seal nurseryware. I now hear that the winner of the £100 first prize is Mrs S. Wender, of London, with her picture of Lorel Jane. Mrs Wender's entry followed her purchase of an Ekco trainer seat from Lullaby, Muswell Hill, London, N.10, who also receive a prize. Second and third prizes of £50 and £25 were won by Mrs B. P. Russell, of Birkenhead, and Mrs J. S. Gaskin, of Leatherhead.

Judging of the many hundreds of entries was done by a panel of three judges—Miss Gwen Robyns, of the *Daily Mirror;* Miss Jean Lorimer, of Fleetway Publications Ltd.; and Mr David Radford, director and general manager of Ekco Plastics Ltd. The 1960 Ecko 'Picture Baby' Competition has now been launched. I am sorry to say that for the best reasons I cannot be a competitor!

Question Corner—107

(Second Series)

432. Give some account of the manufacture of polyvinyl butyral.

(Answer next week)

Answer to Question Corner—106

431. Essentially, slush moulding is a technique in which a viscous liquid, or paste, is poured into a mould, allowed to remain for a pre-determined period and then the surplus poured off. This leaves a lining on the interior of the mould which is subsequently cured or dried, and removed.

There are two basic systems used which are known as the single-pour and double-pour systems.

In the first the moulds are filled by gravity, pressure or vacuum and the mould is then heated so as to give the wall thickness desired, for example, in hot water. The surplus material is then poured off and the lining gelled or cured in an oven, the time depending on the size and wall thickness of the finished article, as well as the thickness of the mould. The mould and product are then cooled and the latter removed from the mould.

In the double-pour system the cold mould is filled with the material, allowed to remain for a few minutes and the surplus poured off. The mould is then passed through an oven to semi-fuse the thin lining, and filled a second time, the surplus drained off and passed to a second oven for final curing. The mould is then cooled and the product removed from the mould.

When a sponge article is required, the first pour will be of a non-foaming plastisol and the second will include a foaming component.

(Another question next week)

Polly Ester Says . . .

Inter-facial tension—chin-to-chin argument.

Institution of Rubber Industry

REPORT OF THE 1959 EXAMINATIONS

QUESTIONS set for the 1959 Associateship examinations of the IRI are given below, preceded by the comments of the chairman of the Examinations and Qualifications Board and followed by the reports of the examiners.

The standard of the candidates in chemistry and physics appears to have been fairly well maintained, as compared with last year's; nevertheless, 20 candidates did not reach the pass mark in chemistry, and 19 in physics. In Rubber Technology I and II there was a slight improvement. The introduction of report writing as part of the essay paper showed that candidates need more instruction and practice in this important subject. Some of the translations from French and German were very poor.

Candidates still fail to plan their time properly and waste it by the introduction of irrelevancies. They cannot expect high marks if they do not complete the required number of questions.

RUBBER SCIENCE I

Chemistry

Q. 1. *You are required to report on the variations between four batches of lithopone with respect to their zinc contents. You have three analysts at your disposal. Prepare a plan of experiments and describe the statistical tests that you would apply to the results to enable you: (a) to estimate the standard error of the analysis as it is performed in your laboratory, (b) to decide whether or not the batches are alike in their zinc content, within the experimental error of the determination, and, (c) to decide if the results of any one analyst are significantly higher or lower than those of the other two.*

Q. 2. *Explain, with the aid of a diagram, why you would not use the same indicator when titrating a dilute solution of acetic acid with sodium hydroxide as when titrating dilute ammonium hydroxide with hydrochloric acid.*

How would you determine by volumetric titration the amounts of acetic acid and hydrochloric acid in a solution containing both acids?

Q. 3. *The ingredients of a white sidewall are natural rubber, zinc oxide, lithopone, mercaptobenzthiazole, stearic acid and sulphur. What analytical methods would you employ to estimate how much of the total sulphur is present as: (a) free elemental sulphur, (b) sulphur combined with fillers, (c) sulphur combined with rubber.*

Q. 4. *What are the factors which determine the position of equilibrium in a reversible reaction? How may a reversible reaction be made to go to completion? Illustrate your answer by giving examples.*

Q. 5. *A rubber chemical was found to have the following percentage composition: Carbon* 44.96; *sulphur* 40.01; *nitrogen* 8.74; *hydrogen* 6.29. *A molecular weight determination by a cryoscopic method gave the following results: Freezing point of* 20 *g. of pure solvent* 5.51°*C. Freezing point of solvent after addition of* 0.400 *g. of substance* 5.19°*C. The constant K for* 100 *g. of solvent is* 51.18.

When the substance is heated with alcoholic potassium cyanide solution and a few drops of aqueous ferric chloride are added a blood-red colour is obtained. Mild reduction of the substance in solution yields a solution from which piperidine can be recovered. What is the probable structural formula of the material and what are its principal characteristics? You are given the following atomic weights: Carbon 12.010; *sulphur* 32.070; *nitrogen* 14.008; *hydrogen* 1.008.

Q. 6. *The following tests are frequently specified as aids to the quality control of natural rubber latex. Explain the significance of* each *of the following terms: (a) KOH number, (b) volatile fatty acid number, (c) electrical conductivity, (d) pH. How would you determine* either *the KOH number* or *the volatile fatty acid number?*

Q. 7. *What is an isotactic polymer? Explain how the spatial arrangements of groups attached to the main chain of a linear polymer influence the properties of the polymer.*

Q. 8. *How would you prepare in the laboratory: (i) Acetylene from ethylene dibromide* and *(ii) acetaldehyde from acetylene. Why is acetylene important as a starting material for the manufacture of synthetic elastomers? Describe the production from acetylene of one type of synthetic rubber.*

Q. 9. *How is white rubber substitute (factice) produced? What chemical tests would you make to check the suitability of a sample for use in rubber compounding? How does white factice differ chemically from dark factice?*

Q. 10. *What are the similarities and the differences between guttapercha, balata, and* Hevea *rubber, in terms of their respective hydrocarbons and the properties of the other constituents present. Outline the evidence on which modern views of the configurations of the hydrocarbons are based. Compare three chemical derivatives of gutta-percha with those of* Hevea *rubber.*

EXAMINERS' REPORT

In 1958 the examiners in chemistry were able to report a real improvement in the standard achieved by the candidates. This improvement has, unfortunately, not been maintained. In 1958 one candidate in three secured a mark of more than 60%; this year only one in five attained this level.

In a number of cases candidates appeared unable to answer the requisite number of questions, which is surprising considering the wide choice provided. Of the eight candidates who chose Q. 1, only one or two gave adequate answers. The rest appeared to be unfamiliar with the application of statistical tests of significance to chemical problems. Q. 2 on acidimetry appeared to give difficulty to many candidates, and very few satisfactory answers were received. The problem of determining acetic and hydrochloric acids in solution together defeated all but two or three candidates. No one gave conductimetric titration as the preferred method.

Q. 3 on sulphur determination was the most popular choice and many candidates answered it well, although some made the mistake of identifying free elemental sulphur with acetone-extractable sulphur. Several candidates used *sulphuric* acid to acidify the solution containing the sulphur to be determined before adding barium chloride! The question on reversible reactions (Q. 4), as might be expected of such a standard text-book question, was satisfactorily answered by most of the candidates who chose it.

Arithmetical questions are usually unpopular, but many candidates successfully tackled Q. 5 on the characterization of a substance from its empirical composition and freezing point depression. Possibly some identified the substance intuitively and used the numerical data as confirmatory evidence. The formula for piperidine caused some difficulty and was confused with pyridine by some candidates.

A fair number of candidates answered the question on natural latex (Q. 6), but some of the answers were confused and unsatisfactory. It was frequently stated, for example, that the electrical conductivity of latex determines its suitability for the production of electricians' gloves. Q. 7 dealing with stereospecific relationships in linear polymers was not popular, but some good answers were received from candidates who had the courage to attempt it. Although Q. 8 was popular —it was attempted by some 70% of the candidates—the preparations of acetylene from ethylene dibromide and of acetaldehyde from acetylene were not well known and produced some rather surprising methods. Only three candidates dealt adequately with the use of acetylene in elastomer synthesis.

The question on factice (Q. 9) was popular and produced some good answers, although the quantities of

sulphur chloride used and the reaction conditions specified were widely divergent. Q. 10 on the relationships between different natural polyisoprenes produced very few good answers. In many cases the second part dealing with the chemical derivatives of gutta-percha and natural rubber was completely ignored.

F. A. JONES,
M. W. PHILPOTT.

RUBBER SCIENCE II

Physics

The general standard was about average, although the examiners are pleased to note that there were fewer papers of a very low standard than there have been in recent years. The number of candidates who did not attempt the full number of questions is still too high, and some of those who just failed would have been successful if a small part of an additional question had been answered.

Q. 1. A pendulum for measuring rebound resilience has a mass of 6,000 *g. and a moment of inertia about its pivot of* 4×10^7 *g. cm.*^{2}. *In equilibrium the striker, which is* 100 *cm. from the pivot, just touches the test piece. The test procedure consists of moving the pendulum arm from the equilibrium position through an angle such that the centre of gravity of the pendulum rises* 7.6 *cm. above the equilibrium position. The pendulum is then released and allowed to swing freely and rebound. Calculate the velocity of the pendulum at its point of contact with the test piece just before impact. If the rebound resilience of the test piece is* 65%, *what would be the instantaneous velocity of the contact point of the striker just after impact? (Assume the acceleration due to gravity is* 980 *cm. sec.*$^{-2}$ *and that the system is frictionless.)*

If you were designing a pendulum for this type of test, what dynamic consideration would influence your choice of location for the point of impact on the pendulum?

(4 answers). There was no evidence of any clear understanding of a very common test method.

Q. 2. Discuss the principal differences between the physical properties of vulcanized natural rubber, steel, and polythene. To what extent can these differences be explained qualitatively in terms of the molecular structures of these materials?

(34 answers). Most answers were only fair and omitted consideration of non-mechanical properties, e.g. density, thermal and electrical conductivities, and melting points.

Q. 3. What are the principal difficulties in measuring the electrical conductivity of a vulcanized rubber tread compound? How would you overcome them?

A test specimen of vulcanized natural rubber tread compound is stretched 100% *in the direction along which its electrical resistance is being measured. The resistance of the stretched specimen is thirty times that of the unstretched specimen. How much greater is the specific resistance of the stretched compound than that of the unstretched compound? Assume that no volume change takes place on stretching.*

(34 answers). A fairly good knowledge of the difficulties and the necessary remedies in conductivity testing was shown. A surprising number of candidates were unable to answer correctly the very simple rider.

Q. 4. What are beta rays? Discuss the mechanisms by which beta rays are absorbed in rubber. How can beta ray absorption be used for gauging the thickness of rubber sheets? For approximately what range of thicknesses is the technique appropriate?

(19 answers). Most of the answers gave satisfactory descriptions of the methods of thickness measurement using β-rays; a much smaller number knew the mechanisms of β-ray absorption by rubber, or even the constitution of β-rays.

Q. 5. Describe (a) a dead load instrument and (b) a spring loaded instrument for measuring the hardness of vulcanized rubber. Explain the methods of use of both instruments and the methods for carrying out any necessary calibration. Compare the two types of instrument for: (a) reproducibility of results, (b) range of utility in a rubber factory. Indicate the nature of the relationship between British Standard Hardness degrees and Young's modulus.

(37 answers). A high proportion showed a good knowledge of the principles, methods of use, and limitations of hardness testers.

Q. 6. Give an account of a statistical method for estimating: (a) if a sample mean differs significantly from a standard value, (b) if two independent sample means differ significantly from each other.

A rubber moulding is required to have a hardness of 65 *BS°. The following values were obtained by a single operator with a single test machine, when a single measurement was made on each of ten mouldings:* 67, 68, 67, 67, 69, 66, 64, 66, 63, 68. *Does the mean hardness differ significantly from the specified value? For nine degrees of freedom the percentage points of the t-distribution are: Probability* 50%, 25%, 10%, 5%, 2.5%, 1%; *t* 0.703, 1.23, 1.83, 2.26, 2.68, 3.25.

(12 answers). Only 3 answers indicated an understanding of the student's 't' test adequate for its application in the solution of problems.

Q. 7. Define the viscosity coefficient of a liquid. Describe two methods for measuring the viscosity of a liquid, of which at least one must be capable of yielding data in absolute units of viscosity.

The space between two coaxial cylinders of radii r and R is filled by a liquid of viscosity η. *Calculate the moment per unit length necessary to hold the outer cylinder at rest when the inner cylinder is rotating at n revolutions per minute.*

(28 answers). Methods of measurement of viscosity coefficient were generally known, but only a very few candidates made any serious attempt at the rider.

Q. 8. Define the latent heat of vaporization of water.

2 kg. of water at 20 *C. are contained in a well-lagged vessel having a water equivalent of* 500 *g. The water is heated by an electric immersion heater of resistance* 15 *ohms connected to a* 240 *volt electric supply. Calculate: (a) the time of heating for the water to boil, (b) the rate at which the water is then boiled off. Assume that no heat is lost from the system. The latent heat of vaporization of water is* 540 *cal/g., the specific heat of water is* 1 *cal/g.°C., 1 calorie* = 4.18 *joules.*

(34 answers). Most of these scored high marks.

Q. 9. Evaluate the following:

(*i*) $\int \frac{7x - 8}{3x^2 + x - 2}\,dx$

(*ii*) $\int \frac{dx}{1 - x^2}$

(*iii*) *By a suitable substitution in* $\int \frac{dx}{1 - x^2}$ *show that*

$$\int \sec\theta\, d\theta = \tfrac{1}{2} \ln \left(\frac{1 + \sin\theta}{1 - \sin\theta}\right) + C$$

Evaluate the following:

(iv) $\int e^x \cos x\, dx$

(v) $\frac{d}{dx}(\exp x^n)$

(8 answers). Careless mistakes robbed some of best marks.

W. P. FLETCHER.
D. G. MARSHALL.

(To be continued)

British Standard

Latex for Transport Seating

This new publication (BS 3157) specifies requirements for articles made of latex foam rubber, for use in the seating of private and public transport, including aircraft. The foam rubber is classified into nine hardness grades, and requirements are specified for materials, construction, surface condition and for various physical and chemical properties.

Appendices deal with: indentation hardness index; indentation set; pounding test; elongation at break; low temperature flexibility; grab test; an organic materials staining test; and, finally, a number of helpful 'notes for designers.'

The address of the British Standards Institution Sales Branch is 2 Park Street, London, W.1.

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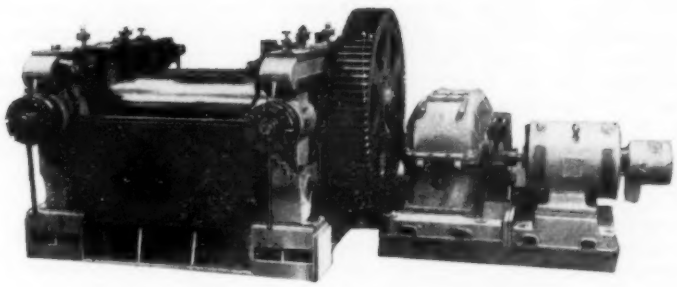

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Sixth Annual Convocation

NATIONAL COLLEGE OF RUBBER TECHNOLOGY

THE chairman of the board of governors, Mr H. Rogers, welcomed a large and distinguished audience to the sixth convocation of the National College of Rubber Technology on February 25. He said that this was an opportunity for industry to meet students—and for students to meet their future employers.

The head of the college, Dr F. H. Cotton, referred in his report to the Plastics Technology course. They had approached the Minister of Education on this aspect, and he had replied that it was the function of the college to promote the study of polymers. Major courses in high polymer technology were recommended but full implementation of this would have to wait for physical expansion of the college. Certainly he thought there would be a tremendous expansion in the years to come. Extension plans for the college had been agreed by the Board and submitted to the Minister.

Earlier Dr Cotton had said that in 1958/9 123 full-time students had attended a variety of courses. The new sandwich courses, which he confessed he had been a little dubious about to begin with, were proving very successful. Unfortunately the rubber industry as a whole was slow in coming forward to support them.

Members of the staff published 24 papers during the year, and 9 reports on special subjects. In the holiday period, one group of students visited factories in the North-West and another visited research organizations in Italy.

In the absence of Sir John Dean, who had had to fly to Canada on urgent business, Dr T. J. Drakeley, Principal of Northern Polytechnic, presented the prizes and diplomas. Five students gained the Licentiateship of the National College (LNCRT), six the Associateship (ANCRT), and one the Fellowship (FNCRT). The last award went to Dr D. B. Vidwans, a Colombo plan scholar now teaching in Bombay. External awards were also presented; twenty-two students being awarded the LIRI and eight the AIRI. The *Rubber Journal* prize of £25 for the best practical work in the second year of the Associateship course was shared between two students: D. Lawson and R. W. Sambrook. S. H. Coulson was awarded the British Geon prize of £25, and the Ronald Trist award, also of £25, went to J. Bayley.

In his speech Dr Drakeley, who used Sir John Dean's notes interspersed with his own comments, said that since the IRI had been established in 1921, there had been a much better understanding between all factions of the industry, and he liked to think that the National College had helped in this. They had come a long way from the time when employers were so suspicious that they were reluctant to let their employees attend the college in case commercial secrets passed between them!

Sir John, Dr Drakeley said, emphasized that a student should go on to take a higher degree if he could, and he also stressed that a commercial attitude could not be acquired too soon. A product is no good unless it can be sold—at the appropriate time and at the appropriate cost. He had sometimes heard it said that the polymer industry did not offer chances of promotion. But it was a young industry. Sir Henry Wickham took his famous rubber seeds from Brazil to Kew less than a hundred years ago. You are, he told the students, in a young industry, where you have every chance of promotional success.

Some of those present at the sixth annual convocation of the National College of Rubber Technology were *(left to right)*: **1. B. R. Roberts (Chairman of the Governors, Northern Polytechnic), Dr T. J. Drakeley (Principal, N. Poly.), Dr F. H. Cotton (Head NCRT). 2. M. Kaufmann (Senior Lecturer, Plastics Tech.), W. S. Gray (Governor, NCRT). 3. J. A. Brydson, K. J. Saunders, J. A. Ratcliffe (Secretary, Plastics Institute). 4. S. D. Sutton (Governor, NCRT), Fred Train (Governor, NCRT), 5. W. T. Scheele (British Bata), Mrs Scheele A. R. Loughton (British Bata).**

COMPANY MEETING

The Rubber Trade Association of London

ACUTE SHORTAGE OF NATURAL RUBBER SUPPLIES

Active Sales Programme from Synthetic Manufacturers

Mr G. F. McIvor's Address

THE annual general meeting of The Rubber Trade Association of London was held on February 29 at the Rubber Growers' Association, 19 Fenchurch Street, London, E.C.

Mr G. F. McIvor, the chairman, said:

During 1959 the rubber industry has faced the most acute shortage of supplies of natural rubber for 50 years. In making this statement I am excluding the periods of artificial stringency created by the narrow sighted workings in 1925 and 1926 of the Stevenson Scheme and by the effect of stockpiling programmes in 1950 and 1951.

Growth of Consumption

Time spent in delving into the past is profitable only if deductions are made from the information obtained which can be applied to assist in solving present and future problems and bringing present conditions into proper perspective. Even healthy children suffer from growing pains and it is not surprising that the rubber industry should have suffered from time to time from such similar complaint. It is interesting to recall that the consumption of natural rubber first exceeded a figure of 100,000 tons in 1910, 250,000 tons in 1919, 500,000 tons in 1925, 750,000 tons in 1929, 1,000,000 tons in 1936, 1,500,000 tons in 1950, and 2,000,000 tons in 1959.

A tribute is due to the plantation industry for keeping pace with such expansion and to the synthetic industry for providing the further 1,600,000 tons which were required in 1959 to satisfy consumers' needs. One man's meat is another man's poison though in the present context the poison is a necessary stimulant to keep the patient going, and will certainly be an essential need in the future. On the one hand, the war and the political changes in some producing areas which followed it seriously impeded expansion of production of the natural product: on the other, war-time requirements made the establishment of a huge synthetic industry a matter of the highest priority without heed to the expenditure involved.

Both natural and synthetic production has been expanded by fortuitous circumstances: the Stevenson Scheme has always been condemned as inherently unsound—the conditions it created and which were instrumental in its abandonment had encouraged planting in areas outside the Scheme, the production from which was found to be fully required 10 years later: war-time necessity and Government finance on a scale which private industry could not have provided in so short a time was the foundation of synthetic production which has been so vital in the post-war era.

Expansion of Consumption of Synthetic

The following figures show the expansion of the consumption of synthetic rubber since 1948:

	USA	Other Countries	Total
1948 ...	442,000	38,000	480,000
1951 ...	759,000	53,500	812,500
1954 ...	636,000	104,000	740,000
1957 ...	926,000	331,500	1,257,500
1959(est)	1,060,000	467,000	1,527,000

In the early years after the war the only synthetic production of any significance was in the USA. Even if an exportable surplus had been available, the world dollar shortage hindered distribution to other countries. Now every major consuming country is fostering its own synthetic supplies. It must therefore be appreciated that with this process of de-centralization and the establishment of what are virtually national industries, too close a comparison in costing between synthetic and natural may well prove misleading.

Crisis of Greatest Magnitude Avoided

A crisis of the greatest magnitude has only been avoided by the implementation of the decisions to liquidate the British Government stockpile and to make a substantial reduction in the USA stockpile. The anticipation of these releases not unnaturally influenced consumers both in this country and in other parts of the world to keep their purchases to a minimum and the resultant pent-up demand, coming on top of an already existing shortage of supplies, allowed 27,000 tons from the British and 29,160 tons of so-called 'deterioration' rubber from the USA stockpile to be absorbed in 3½ months with comparatively small effect on prices. The firmness experienced in November and December caused surprise and disappointment in many quarters and murmurs that the market was being manipulated were heard. The Officers of the Association watched the situation in London with care and not without some anxiety and it can be said that the position, often described as a technical one, was really a true reflection of the supply position and we were satisfied that no undesirable speculative element was responsible for either the pressure on near positions or for the overall price fluctuations.

It was perhaps unfortunate that legislative procedure prevented the British and USA disposal programmes commencing together on October 16. The subsequent high prices would have been more easily ironed out and the market might by now have more information of American intentions and the rate and scale of their releases. This aspect is of the greatest statistical importance as sales from both stockpiles must be regarded as sources of new supply. Widely opposing opinions are heard as to the probable rate of releases from the USA stockpile and the willingness of industry to absorb them.

One view still being expressed is that not more than 50,000 tons per annum should be expected while, on the other hand, it is more generally believed that the American programme will be worked within a framework similar to that published by the British Government. It is a matter of regret that this could not have been made more clear.

Tribute to Board of Trade

I am glad to have this opportunity of expressing appreciation to the officials at the Board of Trade for the way the disposal scheme has been organized. We have experienced the closest co-operation and understanding on the various problems—usually of a minor nature—which have arisen. We do not forget the thanks that are due to the staffs at the Depots, without whose willing help delivery difficulties must have arisen.

At this point I would like to call to mind the forecast made by the late Mr P. W. Litchfield of the Goodyear Tyre and Rubber Company in June 1951. In his notes on America's rubber industry of that date he forecast a shortage of all rubbers in 1960 unless strenuous efforts were made immediately to expand synthetic production, in which year he said that world markets could consume as much as 4,000,000 tons. This forecast was made in a year when the current figures were 1,500,000 tons of natural and 812,000 tons of synthetic. At the time, some will remember, his prognostications were dubbed as blatant propaganda for the synthetic industry. Events have shown that he foresaw the expansion of production of natural rubber to be limited to a degree that the demand he envisaged could only be satisfied by added quantities of synthetic. It may be that other leaders in the industry held similar views, but I mention Mr Litchfield by name for the simple reason that I have a copy of his 'Looking Ahead to 1960' before me.

Extravagant Claims for Synthetics

The natural rubber industry must expect to encounter a most active sales programme from the manufacturers of synthetics and this is already much in evidence: it must be prepared to take steps to counter some of the extravagant claims that are being made. Claims for better lasting qualities, particularly in tyres, are quite under-

standable, but in one American magazine I have noticed a colourful advertisement showing better riding qualities and resilience with no squealing on corners from tyres made of a particular brand of synthetic. In fairness, it should be said that the advertiser did state they were not manufacturers of tyres. This recalled a discussion I had with a leading chemist in the tyre industry. After the long dry summer, the roads in this country were in many places rendered dangerous by films of oil and rubber deposits and this was most generally ascribed not only to the rarity of a dry summer in this country but to the increased traffic on the roads. In reply to a question as to whether treads containing synthetic rubber were more likely to contribute to this oily condition of the roads, the reply was emphatically in the affirmative. Perhaps it is preferable to having squealing on the corners. I make mention of this as a matter of possibly some topical interest and not as of any market significance.

Graphs showing the price fluctuations of natural rubber as opposed to the static price of synthetic are being circulated regularly and it is noticed that it is the spot quotation that is invariably used for this comparison. In times of acute shortage, the Spot price is most vulnerable to erratic price movements and the tonnage involved is usually insignificant. A much less erratic graph could be prepared if the quotations for shipment, say, two to three months forward, were used.

Packing and Grading

This Association has taken an active part in endeavouring to obtain an improvement in packing and grading and at times it has been felt that we have not had the fullest support from the countries of origin and that our motives have been misunderstood. Much thought is being given to research and Malaya has taken an active lead in this field. I do feel that whatever may be the outcome of such research programmes, an improvement in the presentation of the commodity, as we know it today, is a matter of supreme importance and an invaluable counter to comparisons with the synthetic product.

I have refrained from giving too many detailed statistics; no industry is better served in this respect than by the work done by The Secretariat of the International Rubber Study Group. The uncertainties of Indonesian production and exports and the difficulty in assessing the requirements of the USSR and other Iron Curtain countries are ever present. It is to be hoped that in the not too distant future, the USSR may be seen as Members of the International Study Group—I should perhaps make it clear that this is the expression of a personal view.

Current Supply Estimates

Current estimates make it reasonable to believe that the supply of natural rubber can be raised to 2,400,000 tons by 1965 which is not a very high percentage annual increase. It is gratifying that the countries of West Africa will make an increasing contribution to this expansion.

If credence can be placed on estimates for the increasing demand for all rubbers in the next 5 to 10 years, stockpile releases, which have been accompanied by similar decisions in other countries, may only be giving a comparatively temporary breathing space in providing the adequate supply of natural rubber. Expansion of consumer demand which it would appear can be satisfied only by further increases of synthetic production will go on though not without periods of marking time and periodic set-backs. The increase in the output of synthetic may be limited from time to time, as indeed it is at this moment, by shortages of constituent materials, notably butadiene. The natural and synthetic products will remain complementary to each other for some considerable time to come—such a condition must not breed complacency.

Common Market Meeting

The representatives of the European Common Market States meeting in Rome to discuss joint external tariffs for imports into their area have reached 'quick agreement' on tariffs for synthetic rubber, according to conference sources. There are no further details at the time of going to press.

Sandac Rubber Estates has received an offer of $M775,000 for the Tabanac estate.

GLASS FIBRE FOR PICKLING TANKS

Glass fibre reinforced plastic covers are now being used on strip pickling lines at the Abbey Works of The Steel Company of Wales Ltd. No metal reinforcement is used in their construction and they replace rubber-coated steel covers which had been found unsuitable due to corrosion problems. The main difficulty to be overcome on this pickling plant was that acidic vapours and the splashes from the sheet steel as it passed through a liquid containing 25% sulphuric acid corroded the steel covers and caused dangerous weaknesses for operators who may have to walk over them. Glass fibre reinforced plastic proved the most suitable alternative material to meet this requirement and also provided an additional safety factor in that the surface is non-skid and easy-to-clean. On No. 2 pickle line at Abbey Works, each glass fibre cover measures 13ft. x 9½ft. and weighs about 600lb., polyester resin accounting for over half this total weight. Rubber strip is bonded around the edges of each cover to prevent sulphurous gases escaping from the pickling tank.

Mr A. E. Frost, a deputy treasurer of Imperial Chemical Industries, has been appointed treasurer in the place of Mr J. H. Cotton, who retires on March 31 after 32 years with the company. He has been treasurer since 1952.

This lightweight caravan trailer, which turns into a tent, weighs only 3½ cwt. and can be towed by the smallest car. Moulded entirely with British Resin's Cellobond polyester resins and glass fibre by Hill's Fibreglass Developments, it can change from trailer to tent (the roof is collapsible) in 13 seconds

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CONDUCTIVE RUBBER

ITS PRODUCTION, APPLICATION AND TEST METHODS

R. H. NORMAN, M.Sc., A.Inst.P., A.I.R.I.

Senior Physicist
Research Association of British Rubber Manufacturers

For the research worker and the technologist this book, which was recently serialized in *Rubber Journal*, will provide a comprehensive outline of the knowledge which exists on the "conductive" or "anti-static" classes of rubber. Among the contents the following subjects are most thoroughly examined: **Contact Resistance; Manufacture; Effect of Stress, Time and other Variables on Resistivity; Test Methods; Variability of Resistivity; Uses of Conductive Rubber.**

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RUBBER JOURNAL AND INTERNATIONAL PLASTICS

131 GREAT SUFFOLK STREET, LONDON, S.E.1

Rubber Statistics

MALAYA — DENMARK — BELGIAN CONGO

DETAILS of Malaya's ocean shipments for the month of December have now been issued and show that her rubber exports during 1959 reached the record level of 1,202,749 tons.

The following table summarizes the December shipment figures:

Ocean shipments to:	Sheet and crepe	Latex
UK	8,856	2,760
USA	7,586	2,554
South Africa	1,348	98
Canada	3,047	—
Australia	1,765	573
Czechoslovakia	2,650	3
France	5,579	616
Western Germany	9,152	2,027
Italy	4,853	479
Poland	2,335	—
Spain	1,940	193
USSR	3,565	—
Brazil	2,118	—
China	10,035	—
Japan	10,775	1,819
Others	8,800	468
	84,404	11,590

Although China and Japan took large quantities of Malaya's rubber during December, they were not, in fact, her best customers during the year. The following table shows Malaya's eight best customers for rubber in 1959; between them they took almost three-quarters of Malaya's rubber shipments.

Ocean shipments to:	Total	%
USA	169,983	14.13
USSR	165,730	13.78
UK	159,333	13.25
Japan	121,104	10.07
Western Germany	90,031	7.49
France	63,996	5.32
Italy	50,639	4.20
China	49,532	4.12
Others	332,401	27.64
	1,202,749	100.00

Malaya's imports also ran at a very high level in 1959, as can be seen from the following table in which both the December and the year's figures are included:

Imports from:	Total Dec.	Year 1959
Indonesia:		
Sumatra	21,728	224,404
Borneo	10,273	106,866
Others	3,559	42,170
Thailand	4,649	33,028
British North Borneo	3,074	44,582
Others	1,503	7,312
	44,336	458,362

Denmark

Danish imports of natural rubber during December totalled 477 tons, according to the Department of Statistics in Copenhagen. This was some 70 tons less than in the previous month, but very nearly the same amount as was imported in December of the previous year. Malaya was the principal supplier sending 204 tons, while Nigeria supplied 152 tons.

Imports of synthetic rubber in December totalled 212 tons, a decrease of 34 tons compared with November, though an increase of some 65 tons compared with a year earlier. The USA supplied 78 tons of this rubber, Belgium and Luxemburg 71 tons, Canada 37 tons and Western Germany 26 tons.

Belgian Congo

The Belgian Congo Rubber Growers' Association announces that the country's rubber exports in 1959 totalled 40,162 tons, as against 35,081 tons in 1958. In its Annual Report it states that European rubber plantations totalled 64,330 hectares early in 1959, an increase of some 3,000 hectares over the previous year, and that of this total 47,979 hectares were yielding rubber. Native plantations totalled 18,514 hectares, of which 8,889 hectares were yielding rubber in 1959 and, in fact, produced 3,600 tons of dry rubber.

The report adds that about 65% of the country's rubber production is in the form of No. 1 sheet.

Rubber Trade Association

Mr G. F. McIvor, chairman of the Rubber Trade Association, said on February 29 that the natural rubber industry must expect to meet a 'most active sales programme,' from synthetic rubber producers and 'this is already much in evidence.' Speaking to the ordinary general meeting, he said the natural rubber industry must take steps to counter some of the 'extravagant claims' being made for the synthetic product.

Instructor for Yugoslavia

The Ministry of Labour has received a request from Yugoslavia, who want an instructor/adviser for rubber compound manufacturing for 2½ months. He will be expected to advise on production methods, mix formulae, etc. Address for further details is: 'Technical Assistance Recruitment Unit,' 26/28 King Street, S.W.1. Reference: E9/ILO/YUG/37.

Mr T. J. Thomas, who was manager of the Polymer Development Section of Dunlop's Research Centre, has been appointed technical manager of Dunlop's Composition Division from March 1.

Rubber Crop Returns

Unless otherwise indicated the figures quoted, to the nearest thousand lb., represent crop returns for the month stated and for the number of months of the planting company's financial year to date. Corresponding figures are given in parentheses.

HARRISONS AND CROSFIELD

January

Allied Sumatra—787 (882). 1 mth.—787 (882).
Asahan—104 (126). 6 mths.—611 (750).
Bah Lias—154 (172). 3 mths.—483 (514).
Central Sumatra.—77 (97). 7 mths.—502 (656).
Lankat Rubber.—74 (65). 10 mths.—688 (628).
Mendaris.—187 (216). 1 mth.—187 (216).
Namoe Tongan.—240 (278). 5 mths.—1,208 (1,373).
Sialang.—238 (247). 12 mths.—2,441 (2,367).
Soengei Rampah.—45 (57). 1 mth.—45 (57).
Tanah Datar.—67 (82). 1 mth.—67 (81).
Tandjong.—176 (172). 7 mths.—1,145 (1,080).
Toerangie.—212 (225). 3 mths.—606 (670).
United Lankat.—32 (32). 1 mth.—32 (32).
United Serdang.—873 (909). 5 mths.—4,567 (4,901).
Bukit Kajang.—111 (—). 1 mth.—111 (—).
Castlefield.—274 (270). 7 mths.—1,927 (1,680).
Golden Hope.—795 (804). 11 mths.—8,199 (7,272).
Holyrood.—102 (81). 1 mth.—102 (81).
Hongkong.—33 (29). 1 mth.—33 (29).
Hoscote.—253 (279). 7 mths.—1,690 (1,744).
Killinghall.—50 (49). 7 mths.—313 (306).
Kuala Selangor.—71 (60). 1 mth.—71 (60).
Kulai.—186 (216). 3 mths.—532 (627).
Lanadron.—459 (455). 1 mth.—459 (455).
London Asiatic.—1,763 (1,670). 1 mth.—1,763 (1,670).
Malaysia.—68 (58). 1 mth.—68 (58).
New Crocodile.—257 (265). 11 mths.—2,606 (2,649).
Pataling.—1,467 (1,252). 3 mths.—4,340 (3,775).
Prang Besar.—328 (247). 10 mths.—2,609 (1,902).
Sandac.—69 (90). 10 mths.—783 (755).
Sapong.—153 (145). 1 mth.—153 (145).
Seaport.—84 (90). 7 mths.—513 (565).
Malayam.—699 (766). 10 mths.—6,778 (6,699).
Lunuva.—121 (134). 1 mth.—121 (134).

SHARPE ESTALL LTD.

Anglo-Johore.—21 (37). 6 mths.—201 (203).
Bekoh CRE.—219 (224). 11 mths.—2,159 (2,050).
KPRP.—69 (70). 11 mths.—617 (535).
Rim (Malacca) RE.—240 (244). 7 mths.—1,649 (1,625).
Sittang Valley RE.—147 (138). 7 mths.—722 (777).
Kurunegala.—28 (28). 1 mth.—28 (28).

January

Surgei-Timah.—57 (55). 10 mths—464 (500).
Kuala Reman.—136.
Batu Tiga.—178 (177). 12 mths—2192.
Kemasul.—40 (49).
Inch Kenneth Kajang.—180 (188).

Synthetic Rubber Prices

Prices of synthetic rubbers appear regularly in RUBBER JOURNAL AND INTERNATIONAL PLASTICS *in the first week of each month. It will be appreciated if suppliers will give notification of any price changes or additions to their range. C/f duty paid quotations are subject to slight variation due to exchange, ocean freight and insurance fluctuations. Prices are in pence per lb., except where otherwise stated.*

(e-qdp)—Ex-quay duty paid (cif UKdp)—cif UK duty paid (e-i)—Ex-installation (ddp)—Delivered duty paid (e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered BM—black masterbatch CBM—cold, black masterbatch CNP—cold, non-pigmented CNS—cold, non-staining COE—cold, oil extended COELC—cold, oil extended, light coloured CO/BM—cold, oil/black masterbatch CPOE—cold, pigmented, oil extended CRE—cold, rosin extended dw—Dry weight HN—high nitrile HNP—high nitrile, powder HP—hot, pigmented HS—high styrene LMW—low molecular weight MHN—medium high nitrile MLN—medium low nitrile MMW—medium molecular weight MN—medium nitrile NS—non-staining TS—total solids

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (e-qdp)
(min., 70,000-lb. lots)

1000 Hot, Non-Oil	23.10
1001 ,, ,,	23.10
1002 ,, ,,	23.34
1006 ,, ,,	23.34
1007 ,, ,,	23.34
1009 ,, ,,	23.71
1011 ,, ,,	23.71
1012 ,, ,,	23.24
1013 ,, ,,	23.94
1500 Cold, Non-Oil	23.10
1501 ,, ,,	23.10
1502 ,, ,,	23.10
1703 COE, 25% oil	*20.31
1705 ,, ,, ,,	*20.07
1707 ,, 37.5% ,,	*18.89
1708 ,, ,, ,,	*18.89
1710 ,, ,, ,,	*18.66
1712 ,, ,, ,,	*18.66

*Under 70,000 lb., min. 600 lb.

ASRC (American Synthetic Rubber Corpn.) (cif UKdp*)
(carloads lots of 30,000 lb.)

1000 Hot, Non-Oil	23.99
1001 ,, ,,	23.99
1004 ,, ,,	23.99
1006 ,, ,,	23.99
1009 ,, ,,	24.61
1018 ,, ,,	26.74
1019 ,, ,,	26.26
1500 Cold, Non-Oil	23.99
1502 ,, ,,	23.99
1503 ,, ,,	26.02
3110 ,, ,,	25.78
1703 COE	20.69
1708 ,,	19.27

*US/£ conversion rate $2.80

Cariflex (Shell Chemical Company) (e-sUK)

S-1000 Hot	22.25
S-1002 ,,	23.375
S-1006 ,,	22.25
S-1009 ,,	24.0
S-1011 ,,	24.0
S-1013 ,,	24.0
S-1100 Hot/black	19.75
S-1500 Cold	22.25
S-1502 ,,	22.25
S-1509 ,,	22.25
SP-103 ,,	28.0
S-1600 Cold/black	19.625
S-1602 ,, ,,	19.625
S-1605 ,, ,,	19.375
S-1703 COE	20.25
S-1707 ,,	18.0
S-1709 ,,	17.75
S-1712 ,,	17.75
S-1803 COBM	17.875

Copo (Copolymer) (cif UKdp)

1006 Hot, Non-Oil	23.25
1500 Cold, ,,	23.25
1502 ,, ,,	23.25
1505 ,, ,,	26.00
1712 COE	18.50
1778 ,,	18.75
3300 CRE	23.125

FR-S (Firestone) (cif UKdp*)

1000 Hot	24.10
1001 ,,	24.10
1004 ,,	24.10
1006 ,,	24.10
1007 ,,	24.10
1500 Cold	24.10
1502 ,,	24.10
146 ,,	24.10
1703 Oil-Extended	20.00
1710 ,,	18.85
1712 ,,	18.85
123 ,,	19.187
155 ,,	18.5
173 ,,	20.00
178 ,,	19.10
184 ,,	18.85
1009 Specialty	24.75
1010 ,,	26.00
1012 ,,	24.25
1013 ,,	25.00
1014 ,,	28.10
1015 ,,	28.75
141 ,,	28.625
181 Specialty	24.10
182 ,,	25.00
158 ,,	29.5

*US/£ conversion rate $2.80

International Synthetic Rubber Co. (d)

Intol 1500	22.5
Intol 1502	22.5
Intol 1006	22.5
Intol 1710	18.0
Intol 1712	18.0
Intol 1778	18.25
	(ex-wks TS)
Intol Latices R23/M23	22.25

Philprene (Phillips) (e-qdp*)

1000 Hot, Non-Pig	23.28
1001 ,, ,,	23.28
1006 ,, ,,	23.28
1009 ,, ,,	24.69
1010 ,, ,,	25.86
1018 ,, ,,	26.80
1019 ,, ,,	26.33
1100 HP	19.65
1104 ,,	19.28
1500 CNP	23.28
1502 ,,	23.28
1503 ,,	26.10
1601 CP	19.56
1605 ,,	19.28
1703 COE	20.23
1706 ,,	19.94
1708 ,,	18.82
1712 ,,	18.58
1803 CPOE	17.78
1805 ,,	15.99

*US/£ conversion rate $2.81½

Plioflex (Goodyear) (ex-wUK)

1006 HNP	22.25
1500 CNP	22.25
1502 ,,	22.25
1507 ,,	22.25
1508 ,,	22.25
1006 S ,,	22.75
1703 COE	19.25
1710 ,,	17.75
1712 ,,	17.75
1773 COELC	19.25
1778 ,,	18.0
B—6	27.5
B—5	28.0

Polysar (Polymer UK) (e-sUK)

S Hot	22.25
S-630 Hot	22.25
Kryflex 200 Cold	23.5
Krylene	22.25
Krylene NS	22.25
Krynol 651 COE	17.75
Krynol 652 ,,	18.0
S-X 371 Process Aid	24.0

Synpol (Texas-US Chemical Company) (cif UKdp)

1000 Hot, Non-Oil	23.10
1001 ,, ,,	23.10
1002 ,, ,,	23.34
1006 ,, ,,	23.20
1007 ,, ,,	23.20
1009 ,, ,,	23.71
1012 ,, ,,	23.24
1061 ,, ,,	23.10
X-274	25.32
8000	23.94
1500 Cold, Non-Oil	23.10
1502 ,, ,,	23.10
1551 ,, ,,	23.10
1703 COE	20.13
1707 ,,	18.71
1708 ,,	18.71
1711 ,,	18.62
1712 ,,	18.48
8200 ,,	18.71

US/£ conversion rate $2.80

SBR LATICES

Copo (Copolymer) (cif UKdp)
(10-ton lots)

2101 (dw)	46.30
X-765 ,,	40.80
X-800 ,,	37.20
2102 ,,	38.00
2105 ,,	38.00
2110 ,,	38.00

Naugatex (Naugatuck Chemical International) (ex-wUK)

2000	39
2001	39
2002	39.5
2006	43
2105	40
2107	40
2108	40
2711	39
2714	39
2733	39
2740	43

Pliolite Rubber (Goodyear) (d)

2000	40

Latex

2001 (dw)	40
2104 ,,	40
2105 ,,	40
2108 ,,	40
5350 ,,	40

Pliolite Resin (Goodyear) (d)

101A (dw)	44
150 ,,	50
151 ,,	35
160 ,,	50
170 ,,	50

Hycar (B. F. Goodrich) (cdp)

2507 (HS) dw	48

Polysar (Polymer UK) (e-sUK)

Latex, type IV	32.5 TS
Latex, type 722	31.75 TS
(Non-returnable 45-gallon drums)	(e-i)
Latex, type 722 (bulk quantities)	28.75 TS

International Synthetic Rubber Co. (ex-wks)

Intol Latex R23	22
Intol Latex M23	22

ACRYLONITRILE TYPES

Butaprene N (Firestone) (cif UKdp)

NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum (e-s)

N—1	75
N—3A	52
N—5	52
N—6G	45
N—7	45
N—8	45
N600X	45

Hycar (British Geon) (UKd)
(500-lb. lots and over)

1001 High Nitrile Hot	52
1041 ,, Cold	52
1002 MHN Hot	45
1042 ,, Cold	45

Hycar (B. F. Goodrich) (ddp)
(500-lb. lots and over)

1411 HNP	66
1432 MHN (crumb)	64
1072 ,, (carboxyl)	66
1312 ,, (liquid)	55
1043 MLN	51
1014 Low Nitrile	61

I.C.I. (min., 5-cwt. lots) (UKd)

Butakon A-4051 HN Cold	52
Butakon A-3051 MN Cold	45
Butakon A-3002 ,, ,,	45

Paracril (US Rubber) (e-sUK)

18-80 Low Nitrile	63
AJ ,, ,,	50
B MLN ,,	51
BJ ,, ,,	51
BLT ,, Cold	51
BJLT ,, ,,	51
C MHN ,,	59
CLT ,, Cold	59
CV ,, (crumb)	60
D High Nitrile	67
ALT	51

Polysar (Polymer UK) (d)

Krynac 800 MN	45
Krynac 802 LN	45
Krynac 803 MN (low Mooney)	45
Krynac 801 HN	52

ACRYLONITRILE LATICES

Butaprene N (Firestone) (cif UKdp)

N-300 (dw)	53
N-400 ,,	60.5

Chemigum Latex (Goodyear) (d)

200 (dw)	65
235 CHS ,,	60
236 ,,	60
245 B ,,	52
245 CHS ,,	52
246 ,,	52
247 ,,	52
248 ,,	52

Hycar (B. F. Goodrich) (ddp)
(dry weight, drum lots)

1551 High Nitrile	66
1552 MHN	57

Hycar (British Geon) (UKd)
(dry weight, 3 drums and over)

1561 High Nitrile	60
1571 ,, ,, (carboxyl)	60
1562 MHN	52
1577 ,, (modified)	52

ACRYLIC TYPES

Hycar (B. F. Goodrich) (ddp)

4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso (e sUK)

Regular 035	21.75
Regular 150	21.75
Regular 215	21.75
Regular 217	21.75
Regular 218	21.75
Regular 325	21.75
Non-staining 065	22.75
Non-staining 165	22.75
Non-staining 265	22.75
Non-staining 267	22.75
Non-staining 268	22.75
Non-staining 365	22.75

Vistanex (Polyisobutylene) (e-qdp)

MS LMW	54
MH ,,	54
L-80 MMW	54
L-100 ,,	54
L-120 ,,	54
L-140 ,,	54

Polysar (Polymer UK) (e-sUK)

Butyl 100	21.75
Butyl 200	21.75
Butyl 300	21.75
Butyl 301 NS	21.75
Butyl 400	21.75
Butyl 101 NS	26.25
Butyl 402	22.5

Hycar (B. F. Goodrich) (ddp)
(500 lb. and over)

2202 Brominated	68

NEOPRENES

	(e-qdp)
W and WHV (dwdel)	42.62
WRT ,,	48.37
WX ,,	44.62
GN ,,	44.62
GNA ,,	44.62
GRT and S ,,	45.62
AC ,,	57.125
KNR ,,	75.62
AC 'M' and 'S' ,,	57.125
CG ,,	57.125
AD ,,	57.125

Latices—Dry
(per lb. del, min., 50 lb.)

571	49.75
842A	49.75
572	51.25
601A	51.87
650	54.125
735	51.25
736	51.25
950	58.25
60	51.87
750	51.25
635	53.62

SILICONE RUBBERS

Midland Silicones
(500-lb. lots del)

Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23s. 6d.

I.C.I. Silicones

Gums (40-lb. lots del)	39s. 6d.-47s.
Stocks (250 lb. lots del)	22s.-35s.
Pastes (1000 lb. lots del)	27s.6d.-35s.9d.

REINFORCING RESINS AND RUBBERS

I.C.I. (min., 2-ton lots) (UKd)

Butakon S-8551	36.5
Butakon S-7001	33.5

Hycar (B. F. Goodrich) (ddp)

2007 (powder)	42.5

Pliolite (Goodyear) (d)

S—6B	36.5

Polysar (Polymer UK) (e-sUK)

SS-250 HS (bale)	27.25
SS-250 ,, (flake)	27.5
Kryflex 252 HS	25.5

Cyclite (Durham Raw Materials) 42

HYPALON

In 50-lb. bags del UK 71.62

Rubber Markets

LONDON

A further rise in prices has been recorded in the London rubber market during the past week. Expectations of rising consumption of the commodity in the future have helped the trend while there have been reports of Chinese and Russian buying. Nevertheless, the market has been quiet with trade limited. Rises in prices generally amount to around ¼d. per lb.

Latest prices are as follows:

No. 1 RSS Spot: 34½d. nominal.

Settlement House:

April 34⅛d.-34⅜d.

April/June 34d.-34⅛d.

July/September 33d.-33⅛d.

October/December 32⅛d.-32⅜d.

January/March 31⅜d.-31¼d.

No. 1 RSS cif basis ports:

March 34⅛d.-34⅛d.

April 34⅛d.-34⅜d.

Godown:

March 117⅜ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, March, seller 20s. 4d., cif European ports, Spot, 20s. 7d. Bulk, 19s. 11d. Creamed, seller, March, 19s. 10d. Normal, seller, March, 15s. 7d.

AMSTERDAM

The Amsterdam rubber market ruled as under on February 29:

	Guilders per kilo	
No. 1 RMA	Feb. 29	Previous
March	3.35	3.35
April	3.31	3.31
May	3.31	3.31
June	3.31	3.31
April/June	3.31	3.31
July	3.21	3.21

Sales: 75 Tendency: Quiet

DJAKARTA

There was slight interest for sheet No. 2 on February 29 and five tons were traded at 40.25 rupiahs per kilo. The market closed very quiet. Sheet No. 1 for ready delivery was quoted at 40.50 rupiahs per kilo nominal.

	Rupiahs per kilo	
	Feb. 29	Previous
Spot No. 1 Priok ..	40.50n	41.00b
Spot No. 2 Priok ..	39.50n	40.00b
Spot No. 3 Priok ..	38.50n	39.00b
No. 1 fine pale crepe, spot	40.50n	41.00b

Tendency: Quiet

SINGAPORE

The market ruled very quiet throughout the morning of February 29 and little business was transacted. Some interest in July/September delivery was met at buyers differentials. Lower sheets were neglected and factories remained quiet. The afternoon was generally quiet. March and April delivery were narrowing slightly. Lower sheets were still neglected and factories disinterested. After hours, the market was quiet.

	Malayan cents per lb. fob Malayan ports to open ports	
	Feb. 29	Prev. close
No. 1 RSS, Mar.	118 –118¼	118¼–118½
Apr.	117⅞–118	117⅞–118
No. 2 RSS, Mar.	116¼–117	116½–117
No. 3 RSS, Mar.	115¼–116½	115⅞–116⅞
No. 4 RSS, Mar.	114½–115½	115 –116
No. 5 RSS, Mar.	111¼–113¼	111½–113½
No. 1 Spot ..	117⅝–118⅛	117⅞–118¼
No. 3 blanket, thick remilled, March ..	114 –116	114 –116
No. 1 fine pale crepe, Mar. ..	134 –136	134½–136½
2x thin brown crepe ..	113⅜–114⅜	114 –115

Tone: Quiet

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums fob at 205.80d. per gallon.

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on February 29 was 37.75 (38.00) US cents per lb.

NEW YORK

The New York rubber market ruled as under on February 29:

DEALERS' PRICES

	US cents per lb., ex-dock	
	Feb. 29	Previous
No. 1 RSS, March ..	40⅜n	40¼a
April ..	40⅜n	40¼a
No. 2 RSS, March ..	40⅛n	40a
April ..	40⅛n	40a
No. 3 RSS, March ..	40⅛n	40¼a
April ..	40⅛n	40⅛a
No. 1 RSS, Spot ..	40⅞n	40⅛n
No. 3 amber blanket crepe, May	39⅜n	39⅜n
No. 1 latex, thin crepe, March	45⅛n	45⅛n
No. 1 latex, thick crepe, March	42⅛n	43n

FUTURES—REX CONTRACT

	US cents per lb.	
	Feb. 29	Prev. close
March ..	41.00b–41.25a	40.90b–41.10a
May ..	40.00t	40.10t
July ..	39.00b–39.12a	39.00b–39.25a
Sept. ..	38.50b–38.70a	38.50b–38.75a
Nov. ..	38.00b–38.25a	38.00b–38.30a
Jan. ..	37.25n	37.20b–37.50a
March ..	36.60n	36.60n

Sales: 25 Tendency: Steady

Rubber futures were steady in quiet dealings on February 29. In physical rubber, trading was light and the undertone about steady.

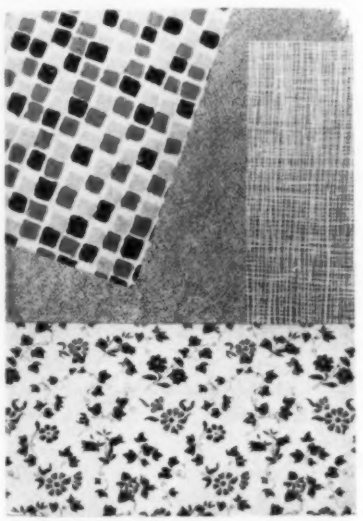
CEYLON

No. 1 RSS

The price for No. 1 RSS Spot, at Colombo on February 29 was 138 (140) Ceylon cents per lb.

Fablon Promotion

Plans for the promotion of Fablon sales for 1960 include the biggest national advertising campaign yet undertaken by the company. Full-page colour and black and white advertisements are scheduled for leading national magazines, and Sunday papers. Television advertising, 60-second spots on all ITV stations, starts on March 15 and will continue until November.



New Fablon designs, in various colours, include Roma (*top left*) **Manakesh** (*centre*) **Cambric** (*right*) **and Floral Chain**

New designs, each available in several colours, have been added to Fablon's already extensive self-adhesive range. Shown with these to trade Press and customers last week were also samples of Fablon polythene film in 0.0015in., 0.0025in. and 0.005in. gauges, as well as black polythene film in the latter grade.

Rubber Plug

African Electrical (Pty.) Ltd., P.O. Box 669, Johannesburg, is making a new Flash rubber-topped electrical plug. The firm states that its durable rubber top makes it almost impossible to break this plug. It is made with pins that can be moved up and down, so that the connexion of wires to the terminals becomes rather less irritating than with some of the models of plastic plugs now on the local market.

Industry INTELLIGENCE

Technical Data

Polyurethane Rigid Foam

Polyurethane rigid foam is produced by mixing together Daltolac 41 and Suprasec D and spraying the mixture immediately after mixing. Special equipment for spraying has been developed by I.C.I. Dyestuffs Division, and particulars of the equipment and its operation as well as details of the properties of the resulting sprayed rigid foam are given in Urethane Chemicals Literature No. 3 issued by Imperial Chemical Industries Ltd., Dyestuffs Division.

Daltocel 41 is a polyether resin blended with tri-β-chloroethyl phosphate (as a fire-retardant), water and other additives. Suprasec D is a diisocyanatodiphenylmethane composition. The commercially available spraying equipment was not suitable for spraying the Daltolac 41/Suprasec D mixture, and the spray equipment which has been specially developed is described and illustrated by diagrams and a photograph. Safety precautions to be observed when spraying the mixture are enumerated and the operation of the equipment is fully described. The properties of the sprayed rigid foam are considered in detail, including thermal conductivity, density, adhesion, mechanical strength, water absorption, chemical resistance, water vapour transmission and resistance to heat, fire and fungi. The combination of *in situ* foaming and good adhesive properties makes sprayed rigid polyurethane foam a valuable material worthy of consideration for a wide range of thermal insulation applications, as for example, in road and rail transport, shipping and building.

Esso Butyl Rubber

Various aspects of Esso butyl rubber are discussed in Technical Information Sheets (TIS) Nos. 13-17, available from Esso Petroleum Co. Ltd., Chemicals Department, 50 Stratton Street, London, W.1.

Dynamic Test Terms. TIS No. 13.—The terms dynamic modulus, dynamic shear modulus, dynamic spring rate, resilience and relative damping are explained.

New Curing Systems. TIS No. 14.—Tellurium diethyldithiocarbamate is recommended for use in butyl rubber for fast cure rate and resistance to reversion. This applies to tyre compounds and to other applications where the rubber is subjected to heat and flexing. For the alleviation of scorching tendencies, the use of a secondary accelerator such as benzothiazyl disulphide is recommended. An alternative method which has shown promise of reducing scorching is to replace the stearic acid in the compound with copper stearate; data illustrating this effect of copper stearate are included. The report concludes with results of Goodrich flexometer tests showing the thermal stability of low-sulphur butyl compounds containing a high proportion of accelerator, two accelerators being compared in this respect.

Tread Cap Compounds. TIS No. 15.—The effect of variation of sulphur content, type of accelerator and process oil content on the properties of butyl tread cap compounds is shown by results of laboratory tests and road tests (8,600 miles at an average speed of 70 mph). The compounds contain SAF black, and notes are given on mixing and processing procedure.

Tread Base Compounding. TIS No. 16.—Two butyl compounds recommended for tread bases for butyl tyres both contain a black system consisting of a mixture of a fine furnace black and a thermal black. Laboratory tests on the compounds are reported. It is stated that butyl tyres of nylon and rayon construction, built with tread bases of the two recommended compounds, have repeatedly survived 70 mph road tests of 8,600 miles duration without separation or signs of reversion.

Tackifier System for Butyl Compounds. TIS No. 17.—The tack of unvulcanized butyl rubber can be improved by the addition of a mixture of two resins, Amberol ST-137X and Pentalyn K. Laboratory test data show the increase in tack achieved by the use of these resins and it is stated that tack levels comparable to SBR-natural rubber stocks can be achieved. In a tyre pilot plant, completely automatic building operations have been attained with butyl rubber containing this mixture of tackifiers.

Machines, Materials and Equipment

Visual Efficiency

Uncorrected defects of vision are likely to reduce efficiency, and lead to increased fatigue and accident rates. Large scale tests of factory workers have shown that in fact 40% of employees are usually found to be in need of eye care. Simplified procedures which will allow a population to be screened rapidly to determine priorities for fuller examination are desirable. They are also valuable in selecting personnel to be employed on tasks in which excellence in some special aspect of vision is important.

An instrument manufactured by J. and R. Fleming Ltd., 146 Clerkenwell Road, London, E.C.1, will check each subject within three minutes, giving indications of visual acuity of each eye for distant and near vision, as well as the degree of co-ordination of the two eyes. The subject is required only to reply to simple questions about a series of test cards which are presented in succession for him to view through the eyepiece. Trained auxiliaries can conduct rapid tests, passing the results to a practitioner.

Double Decker Warehouse

A special mezzanine floor has been designed to increase storage capacity in warehouses. It is in the form of a platform, and can be rapidly and cheaply constructed without building or structural alterations. The floor itself is similar to normal flooring, consisting usually of either tongued and grooved or slatted boards, and is fitted over a framework of rolled steel or tubular joists supported by tubular steel stanchions and Kee Klamp fittings. This platform is a strong, rigid construction, capable of carrying loads of up to about 300lb. per sq. ft. A staircase, handrails, gravity conveyors, and so on can be provided as required.

These platform floors can be tailored to individual requirements, and are manufactured by Tubular Construction Systems Ltd., 135 Battersea High Street, London, S.W.11.

New Publications

Maleic Anhydride

Maleic anhydride was first produced as a by-product from the manufacture of pthalic anhydride, but its increasing importance—in the manufacture of alkyd resins among other things—has led to its straight production. Recognizing its importance, Monsanto have issued a new booklet on the chemical, which gives physical constants, solubility in various solvents, applications in the manufacture of resins and in organic syntheses, and a list of other applications. A final section deals with handling, possible hazards to health and first aid treatment.

Rigidex Newcomers

Three new types of Rigidex high-density polythene have been added to the range of materials marketed by British Resin Products Ltd., and are described in a technical information sheet (No. 10). They are copolymers of ethylene with other olefins and are designed for use in applications where higher resistance to stress-cracking and greater load bearing properties are required.

The new types are Type 3, which has the best mechanical properties and resistance to stress cracking; Type 12, which combines good processing qualities with good all-round physical properties, and Type 40, which is an easy flow grade designed for injection moulding difficult items. Type 3 and 12 can be moulded round metal inserts. The information sheet gives tables showing the physical properties, and other characteristics and recommended uses.

PATENT SPECIFICATIONS

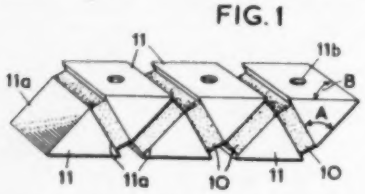
The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Vibration Isolators

No. 822,805. The English Electric Co. Ltd. Inventor: A. Long. Application, March 4 1955. Filed, March 5 1956. Published, November 4 1959.

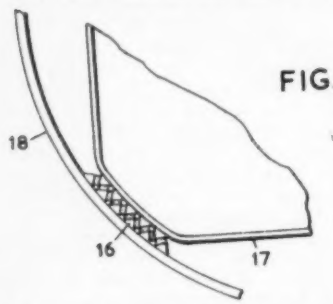
As shown in Fig. 1, a vibration isolator is in the form of a strip built

FIG. 1



up from rubber blocks 10 and prisms 11 of metal or other rigid material, the rubber blocks being secured by bonding or adhesive to the prisms. The prisms are arranged in two staggered rows, the adjacent co-planar faces of the prisms forming the interrupted load-carrying surfaces of the isolator. The

FIG. 2



total area of each load-carrying surface is thus only slightly less than the plan area of the strip. This large load-carrying area is particularly advantageous when the isolator is used to support non-rigid units such as sheet-metal panels or chassis for electrical apparatus.

The isolator as a whole is flexible in at least one plane and hence can be used for supporting objects with curved surfaces as shown in Fig. 2, in which the structure 17, such as a chassis or a tank, is supported within a curved shell 18. The isolator strip can be manufactured in long lengths from which suitable lengths for any particular application may be cut.

Bonding Rigidex Polythene

The bonding of Rigidex polythene forms the subject of Technical Information Sheet No. 9, issued by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1. Both welding and adhesive techniques can be used satisfactorily with Rigidex and the available methods are described in detail.

The two standard methods for welding conventional polythene, namely hot-gas welding and butt welding are used for Rigidex with only slight modifications. Hot-gas welding is extensively used where large-scale fabrications are required, the only equipment needed being a special welding torch of which several types are available. Butt welding consists of heating the components to be welded to a suitable temperature and then bringing them together under pressure. Welds produced in this manner are extremely strong and it is generally recommended that wherever possible this technique should be used. For the adhesive method, polar adhesives or hot-melt adhesives can be used. With polar adhesives, such as epoxy resins, it is necessary to treat the surface of the Rigidex, and suitable procedures are described. With hot-melt adhesives, slight modification of the technique used with conventional polythene is necessary. Adhesives of the hot-melt type have no great mechanical strength, but in applications where good sealing without great mechanical strength is required, this method has many advantages.

Shorter Abstracts

Antioxidant. — 817,411. Farbenfabriken Bayer AG. Filed, February 8 1957.—An antioxidant for natural and synthetic rubbers comprises a mixture of (1) a *p*-phenylene diamine substituted at each nitrogen atom by an alkyl, isoalkyl, cycloalkyl or aryl group and (2) a 2,2,4-trimethyl dihydroquinoline substituted in the phenyl radical by an alkoxy group.

Preservation of Polyester-urethane Polymers. 818,123. United States Rubber Co. Filed, July 31 1957.—Dicyanamides of alkali metals and alkaline earth metals are incorporated in solid and foamed polyester-urethane polymers to preserve the polymers against deterioration caused by moisture and light.

Fire-resistant Plastic Foam. 818,330. Velsicol Chemical Corporation. Filed, August 20 1956.—A fire-resistant rigid plastic foam is made by reacting an organic diisocyanate with a fluid alkyd resin containing chlorendic acid or anhydride.

Tarpaulins. 819,460. E. I. du Pont de Nemours and Co. Filed, August 16 1957.—A tarpaulin comprises a base fabric, preferably nylon, coated on one side with a chlorosulphonated polythene composition and on the other side with a natural or synthetic rubber composition, preferably a neoprene composition. In use, the tarpaulin is installed with the chlorosulphonated polythene side down, that is, in contact with the goods being protected.

Elastomers. 818,287. Montecatini Societa Generale per l'Industria Mineraria e Chimica. Filed, April 15 1957.—Elastomers are formed by chlorosulphonating polymers of alpha-butene, alpha-pentene or alpha-hexene and then vulcanizing the chlorosulphonated polymer.

Flame-resistant Chip-board. 818,574. British Plimber Ltd. and CIBA (ARL) Ltd. Filed, March 28 1958.—Chip-board formed from a mixture of wood chips and synthetic resin is made flame-resistant by incorporating boric acid in the mixture.

Rubber Compositions. 818,725. Imperial Chemical Industries Ltd. Filed, October 16 1957.—The resistance of natural and synthetic rubber compositions to moisture is improved by treating the surface of the rubber composition, before vulcanization, with one of certain complex chromium compounds of the Werner type. The treatment is applicable particularly to rubber compositions obtained directly from latex, *e.g.* by dipping.

Polymers. 819,279. E. I. du Pont de Nemours and Co. Filed, January 7 1957.—Elastomers are formed by co-polymerizing one or more terminally unsaturated monoolefins with a specified type of diolefin, polymerization being effected in a hydrocarbon solvent in the presence of a catalyst made by reacting lithium aluminium alkyls with titanium tetrachloride.

Stabilization of Oil-Extended SBR. 820,601. The Firestone Tire and Rubber Co. Filed, September 23 1957.—Oil-extended SBR is stabilized against rapid decrease of its initial Mooney viscosity value upon ageing prior to vulcanization, by incorporating in the rubber 0.1 to 3 phr of one of the following pigments: zinc oxide, magnesium oxide, calcium silicate or silicon dioxide.

Propylene Polymers. 820,727. Standard Oil Co. Filed, August 31 1955.—Resinous and rubbery polymers of propylene are produced by polymerizing propylene under particular conditions by means of the catalysts described in Specification No. 734,501.

PVC Belting. 821,059. J. H. Fenner and Co. Ltd. Filed, July 10 1957.—A coating of electrically conductive carbon black is applied to the surface of PVC belting to reduce the surface resistivity of the belting and so eliminate the possibility of static surface charges.

Preservation of Latex. 821,872. The British Rubber Producers' Research Association. Filed, December 19 1957.—Natural rubber latex concentrate is preserved by means of ammonia in a proportion of less than 0.5% and more than 0.15% in conjunction with 0.04 to 0.2% of a selenium alkyl dithiocarbamate, *e.g.* selenium dimethyl dithiocarbamate.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Leicester Section. — Wednesday March 9 at the Bell Hotel, Leicester, at 7.30 p.m. Debate: 'That Academic Knowledge is Necessary in the Rubber Industry.' Proposed by Dr C. M. Blow (Precision Rubber); opposed by Dr E. R. Gardner (John Bull Rubber Co. Ltd.).

London Section.—Tuesday March 8 at 5.30 p.m., at the Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, London, W.1. 'The Testing of Carbon Blacks,' by F. Moore (R. W. Greeff). 7 p.m.: 'The Cureometer and Other Methods of Determining Optimum Cure,' by Dr S. H. Morrell (RABRM).

Manchester Section. — Monday March 14 at Newton Heath Technical College, Manchester, at 6 p.m. 'Developments and Manufacture of Life Rafts,' by R. B. Noad (Dunlop).

Merseyside Section. — Monday March 14 at the Exchange Hotel, Liverpool, at 7.15 p.m. 'A Study of Carbon Black Masterbatch Processes,' by E. M. Dannenburg (Godfrey L. Cabot, Inc.).

Midland Section.—Monday March 14 at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6.45 p.m. 'Air Suspensions—A Tyre Engineer's Viewpoint,' by V. E. Gough (Dunlop).

Preston Section.—Monday March 14 at the BTR Industries Social Club, Farington, Preston, at 7.15 p.m. 'Rubber Machinery Trends.'

Southern Section. — Wednesday March 9 at the Cathedral Hotel, Salisbury, at 7.45 p.m. Joint meeting with the Royal Institute of Chemistry. 'Rubber Adhesives,' by H. J. Chard (Dunlop).

PLASTICS INSTITUTE

South Wales and Monmouthshire Section.—Wednesday March 9 at the Angel Hotel, Cardiff, at 6.30 p.m. 'The Processing and Properties of Polypropylene,' by J. G. Nichols and C. D. Wells (Shell).

Yorkshire Section. — Wednesday March 9 at St. Mark's House, 186 Woodside Lane, Leeds, 2, at 7.15 p.m. 'PVC-Coated Metals,' by W. E. Martin (BX Plastics).

Companies in the News

Reliance Plant Sold

H. G. Miles (Holdings) has made arrangements to acquire the plant and premises at Hemel Hempstead operated by the Reliance Rubber Company.

This action has been taken to ensure rapid expansion of the company's facilities to meet the growing demands of the car industry. The factory acquired comprises a working area of 42,000 sq. ft., plus amenities for employees and office accommodation.

The property is held under terms of a lease which has 73 years to run. Possession of the premises will be given as at March 25 1960.

Hozelock

Hozelock, of Haddenham, Bucks., has acquired the sole manufacturing and selling rights of the hose fittings previously made by the engineering division of Airtech, electronic and general engineers, of Haddenham.

Hozelock was formed at the beginning of this year to manufacture and market patent couplings and fittings for all types of rubber and plastic hose and tube. It stems from Airtech following the successful introduction last year of new plastic fittings for garden hose, of which over ¼m. were sold in a test marketing operation. The range of fittings has now been extended to cover many other uses.

Chairman of the new company is Sir Eric Ohlson. Other members of the Board are Mr F. S. G. Codling (managing director), Sir Robert D. Ropner and Mr D. Salisbury Green.

Revertex

The prospects for the current year are encouraging, says Mr T. H. Powell, the chairman of Revertex. Trading during the first four months has been satisfactory and the prospects for the remainder of the year are promising. The company is exporting to over 50 countries and their products are being manufactured in a number of countries outside the UK. More than half of the total tonnage of all the company's products was used outside the UK.

Increases of Capital

H. C. North and Co. Ltd. (296,602), rubber goods manufacturers, etc., 25, Haymarket, S.W.1.—Increased by £4,900 in £1 shares, beyond the registered capital of £100.

Changes of Name

Burstead Plastics Ltd. (528,794), 1 Fitzroy Square, W.1.—Name changed to Henry J. Peters (Billericay) Ltd., on September 24 1959.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

LEDA

(793,107) Plant-pots, rings for ring culture, and containers for growing plants, all made of plastics. Deatron Industries Ltd., Kingsbury Works Estate, Kingsbury Road, London, N.W.9. (Class 21; January 12 1960).

BOLTA (B788,793) All goods included in Class 17. The General Tire and Rubber Co., 1708 Englewood Avenue, Akron, Ohio, USA. Address for service is c/o Mewburn, Ellis and Co., 70/72 Chancery Lane, London, W.C.2. (Class 17; January 19 1960).

PANGIT. (789,586) Compositions in plastic form, consisting principally of rubber. Pang Chemical Vulcanizers Ltd., Imperial House, Dominion Street, London, E.C.2. (Class 17; January 19 1960).

PANGOL. (789,587) Compositions in plastic form, consisting principally of rubber. Pang Chemical Vulcanizers Ltd., Imperial House, Dominion Street, London, E.C.2. (Class 17; January 19 1960).

POLYGLOVE (792,923) Gloves made of polythene plastics and being for domestic and household purposes. C. J. W. Macaulay, National House, 60-66 Wardour Street, London, W.1. (Class 21; January 19 1960).

DEKKOPAD (794,612) Shaped covers made of foamed plastics, being fittings for ironing boards. Scrubb and Co. Ltd., Wimbledon Factory Estate, Morden Road, Wimbledon, London, S.W.19. (Class 21; January 19 1969).

AURLAIN (790,195) Man-made fibres, being raw or partly prepared fibrous materials for use in the textile industry. Blackwood Morton and Sons Ltd., Burnside Works, Burnside Street, Kilmarnock, Ayrshire. (Class 22; January 19 1960).

VYRENE (788,635) Elastic threads of plastics and elastic threads of plastics covered with textile material, all for textile purposes. US Rubber Co., Rockefeller Centre, 1230 Avenue of the Americas, New York. Address for service is c/o T. A. Clayton, 62 and 64 Horseferry Road, London, S.W.1. (Class 23; January 19 1960).

NEW COMPANIES

Poly-Glass (Linings) Ltd. (648,812).—February 5. Capital: £100 in £1 shares. To carry on the business of designers and manufacturers of resin bonded glass fibre, laminated linings to steel, wood and fabricated tanks, to industrial and factory installations and hospitals, laundries and domestic establishments, etc. The directors are: Norman Roffe (permanent), 11 South Road, Morecambe, Lancs.; Helen F. Roffe, 11 South Road, Morecambe, Lancs.; Ralph Modley, 333 Marine Road, Morecambe (all directors of Norman Roffe (Poly-Glass) Ltd.). Regd. office: 11 South Road, Morecambe, Lancs.

Envopak Overseas Ltd. (648,939).—February 8. Capital: £100 in £1 shares. To carry on the business of general exporters, importers, agents and merchants; manufacturers of industrial and other products made of plastic and other materials, envelopes, stationery, seals, etc. The directors are: Frank H. Arthur, 182 Harrington Road, S.E.25; Leonard J. D. Jones, 7 Chantry Close, Kenton, Middlesex (directors of Envopak Ltd., etc.). Regd. office: 20 Southampton Place, W.C.1.

Hela Plastics (London) Ltd. (649,022).—February 9. Capital £100 in £1 shares. The first directors are to be appointed. Solicitors: Cardew-Smith and Ross, 27 Ely Place, E.C.1.

Hygienic Plastic Wrappings Ltd. (649,416).—February 12. Capital: £100 in £1 shares. Roderick C. Wheeler-Baker is the first director. Secretary: Thomas A. Herbert, 156 Strand, W.C.2.

Atec Fabrications Ltd. (649,335).—February 12. Capital: £500 in £1 shares. To carry on the business of manufacturers of and dealers in laminated plastics, etc. The directors are: William E. Cockman, 5 Lower Bourne Gardens, Ware; Arnold Trickey, 60 Farhams Road, Ware. Regd. office: Amwell House, Amwell Street, Hoddesdon.

Lincoln Tyre House (Grimsby) Ltd. (649,486).—February 15. Capital: £3,000 in £1 shares. The directors are: Richard N. Denby and Mrs Marjorie A. Denby, both of 87 Nettleham Road, Lincoln. Regd. office: 41 Portland Street, Lincoln.

Plastic Pools Ltd. (649,496).—February 15. Capital: £100 in 1s. shares. To carry on the business of manufacturers of and dealers in plastic pools, plastics and other compositions, etc. The directors are: Hugo J. Duplessis and Joyce Duplessis, both of Fiddlers Firs, Newtown, Lymington, Hants. Regd. office: Fiddlers Firs, Newtown, Lymington, Hants.

Glass Fibre Plastics Ltd. (649,816).—February 18. Capital: £1,300 in £1 (100 'A' and 1,200 'B') shares. To carry on the business of manufacturers, moulders, prefabricators, producers, exporters and importers of and dealers in glass fibre reinforced plastic articles and glass fibre, plastics and plastic products polyester resins, etc. The directors are: Gordon M. Cave, 80 Lakey Lane, Birmingham, 28; Charles W. Spanton, 42 Camp Lane, Handsworth, Birmingham, 21; Mrs Lily Buller and John A. Williams. Regd. office: Park Lane, West Bromwich.

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on February 24 1960

Wacker-Chemie G.m.b.H. Process for the emulsion polymerization of vinyl esters. 828,693.

Wacker-Chemie G.m.b.H. Process for the manufacture of acrylonitrile. 829,106.

US Rubber Co. Method and device for shaping plastic materials. 828,914.

American Cyanamid Co. Resinous compositions. 828,797.

Johnson and Son Inc., S.C. Amides of 4, 4-bis(hydroxyphenyl)-pentanoic acids and their use in synthetic resin compositions. 828,703.

Kodak Ltd. Polyesteramides. 829,011.

British Celanese Ltd. High linear polyesters. 828,706.

Lonza Electric and Chemical Works, Ltd. Production of acrylonitrile. 828,710.

General Tire and Rubber Co. Bushing assembly. 828,801.

Monsanto Chemical Co. Process for polymerizing conjugated 1.3-dienes. 828,803.

Goodyear Tire and Rubber Co. Elastomeric addition products. 828,814.

Esso Research and Engineering Co. Control of polymerization processes. 828,926.

General Tire and Rubber Co. Stable curable polyurethane compositions and method of making same. 828,718.

General Tire and Rubber Co. Rigid polyvinyl halide composition. 828,721.

Phillips Petroleum Co. Olefin polymers and methods and catalyst for production thereof. 829,127.

Union Carbide Corp. Apparatus for and method of costing tubular materials. 829,016.

Dow Chemical Co. Polymerization of alpha-olefines. 828,828.

Phillips Petroleum Co. Process for catalystic polymerization of olefins and products thereof. 828,830.

Imperial Chemical Industries Ltd. Resinous organopolysiloxane compositions. 828,833.

Phillips Petroleum Co. Separation of butadiene from hydrocarbons by extractive distillation. 829,021.

P. R. Welch. Method of coating a surface with poly-per-halocarbon resin and article formed thereby. 829,023.

Stamicarbon N.V. Process for preparing ω-amino-alkane-nitriles. 828,850.

British Cellophane Ltd. Manufacture of thin-walled tubing from thermoplastic materials. 828,851.

Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius, and Brüning. Manufacture of chlorinated polyethylene. 828,938.

US Rubber Co. Latex sponge rubber. 828,643.

British Insulated Callender's Cables Ltd. Method of making cellular polyethylene. 828,739.

British Oxygen Co. Ltd. Copolymer emulsions. 828,957.

US Rubber Co. Polyolefin plastics. 829,148.

Standard Oil Co. Polymerization of ethylene, propylene, mixtures thereof, or mixtures containing either or both with other polymerizable materials. [Additions to 753,350]. 829,150.

Canadian Industries Ltd. Apparatus and process for pelleting thermoplastic materials. 829,152.

COUNTY COURT JUDGMENTS

NOTE.—*These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.*

A. B. DE PLASIDO, 69 Wyebeck Avenue, Leeds, Yorkshire. Tyre dealer, Wakefield. £256, December 1 1959.

L.M. PLASTICS, 4 Regent Street, 7 Parade, Leamington Spa, Warwicks. Uxbridge, £81 15s. 4d., December 9 1959.

L.M. PLASTICS, 4 Regent Street, Leamington Spa, Warwick, manufacturers. Birmingham, £17 15s., December 16 1959.

W. J. T. OSBORNE, Tyre Depot, Tiptree, Essex, tyre dealer. Norwich, £241 3s. 4d., January 8 1960.

SETTING ASIDE OF JUDGMENT

DEFIANCE RUBBER CO. LTD., 12 Coleman Street, London, E.C.2. Shoreditch, £40 5s.. October 12 1959. Set aside on February 8, 1960.

Latest Wills

Mr Norman Wheeler, of 8 Peaks Lane, New Waltham, Lincs., late secretary of the Norris Rubber Co. Ltd., Grimsby, who died on December 19th last, intestate, left £2,031 gross, £1,990 net value.

Mr Albert Wilson Dyson, of 95 Belper Lane, Belper, Derbyshire, manager of the Derby branch of the Marsham Tyre and Rubber Co. Ltd., who died on December 19 last, intestate, left £1,807 gross, £1,291 net value.

R·I·P·

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(continued)

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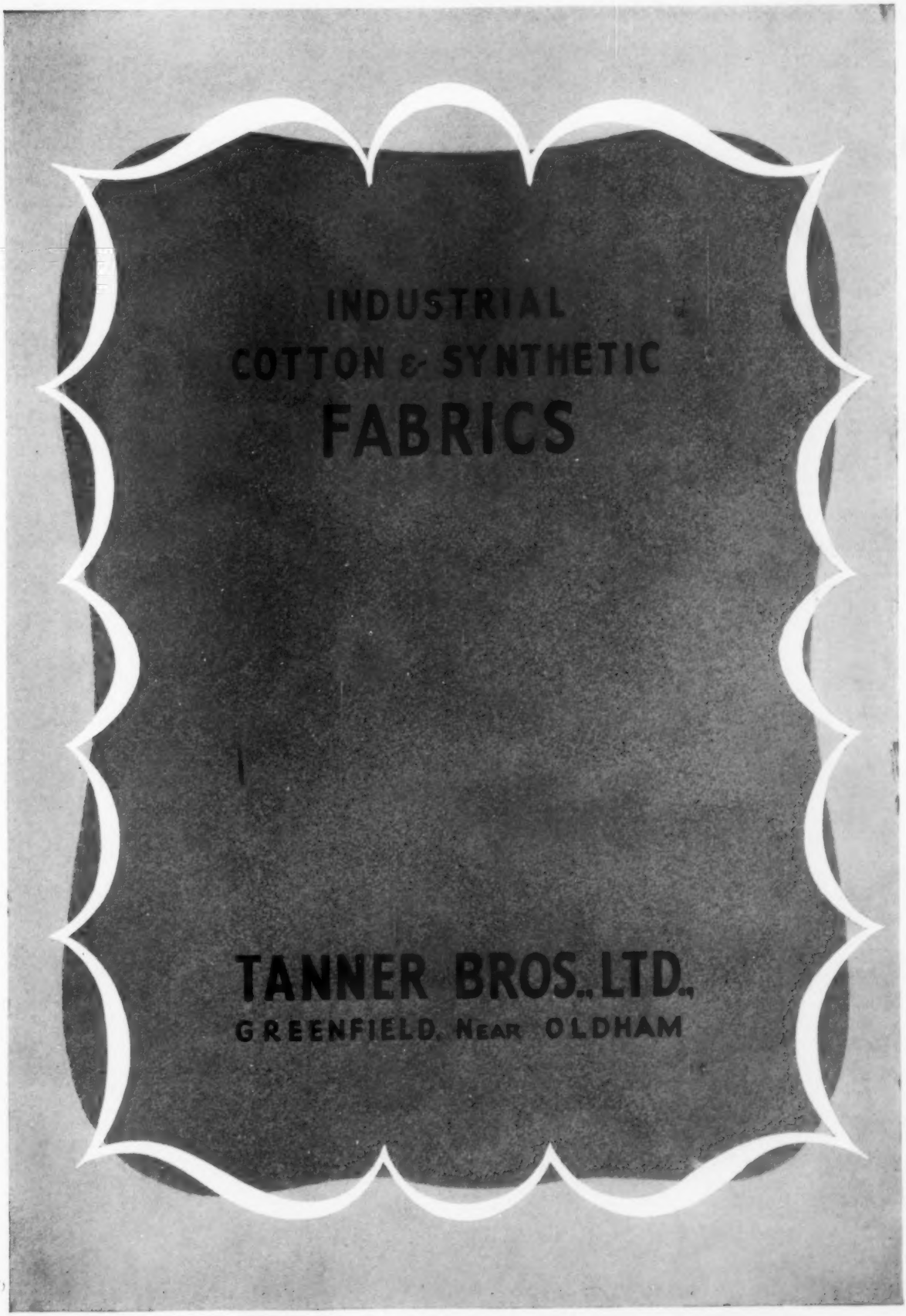
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